Human Health Exposure Evaluation Report

West Virginia State University Property

5000 Fairlawn Avenue Institute, Kanawha County, West Virginia 25112

Prepared for:

West Virginia Department of Environmental Protection

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Attachment 1 Original and Manually Re-screened Groundwater and Air Sample Data Attachment 2 Select Figures from CH2M Hill Reports



1 Introduction

This report was prepared by The Mahfood Group LLC® (TMG) under the West Virginia Department of Environmental Protection (WVDEP), Work Directive No. DEP17*07A-1. This report presents the site-specific human health exposure evaluation (HHEE) for the West Virginia State University (WVSU) property in Institute, West Virginia (site). As directed by the WVDEP, the HHEE was completed in general accordance with USEPA and WVDEP risk assessment procedures (see reference section). Specifically, following discussions with the WVDEP, because this site is not within the Voluntary Remediation Program (VRP) under the West Virginia Voluntary Remediation and Redevelopment Act (VRRA), available data were screened using USEPA criteria with target carcinogenic risks set at 1 x 10-6 and noncarcinogenic target risks at a hazard quotient (HQ) of 0.1 for identifying constituents of concern. This approach results in a conservative analysis. This HHEE was completed with the goal of evaluating potential human health exposure issues associated with findings reported to date for the WVSU property.

The WVDEP work order directive DEP17*07A-1 included a full review of the project-related documents:

	East Property Boundary Investigation (Phase I), (CH2M Hill - August 5, 2013);
	2015 Groundwater Performance Monitoring Report, (CH2M Hill - April 2016);
	Eastern Property Boundary RCRA Corrective Action Investigation – Phase II through V, (CH2M Hill - April 15, 2016) (hereafter "GW Report");
THE STATE OF THE S	Vapor Intrusion Investigation, (CH2M Hill - April 18, 2016) (hereafter "Vapor Intrusion Report");
CONTROL OF THE PARTY OF THE PAR	Soil Vapor Sample Map West Virginia State University Property and Adjoining Parcels, (EnviroProbe Integrated Solutions [EnviroProbe] - September 12, 2016);
	Soil Gas COPC Summary Campus Assessment data table with soil gas sampling results, (EnviroProbe);
	WVSU Vapor Point Boring Logs (15-0137), (EnviroProbe);



	Well Logs (15-0137), (EnviroProbe);
	Soil Gas Implant Installation and Sampling Protocol, (EnviroProbe);
	WVSU Soil Gas Analytical (15-0137), (ESC on behalf of EnviroProbe); and,
	WVSU EnviroProbe Groundwater Analytical, (PACE Labs on behalf of EnviroProbe).
Ad	ditional work order directive tasks included:
	Development of data tables screened against appropriate USEPA human health benchmarks. In addition, figures will be modified from existing reports to show exceedances of applicable criteria by area of concern, as practical, to convey HHEE findings and results previously unpublished. TMG prepared a groundwater data summary table containing the previously unpublished September 2016 EnviroProbe monitoring well sample groundwater data. These results were combined with the previously published CH2M Hill permanent monitoring well data for comparative purposes. The EnviroProbe exterior soil gas data were previously tabulated, but not published. That table in its original form and a re-screened version are included in Attachment 1. TMG modified 5 figures from the Vapor Intrusion Report and the previously unpublished EnviroProbe exterior soil gas concentration figure to reflect the combining of CH2M Hill and EnviroProbe data and also to show changes in exceedances as a result of the data re-screening.
THE STATE OF THE S	Identification of data gaps and information gaps and associated additional data/information needed to further evaluate potential human health exposure issues on the WVSU property. Data gaps are identified as they are relevant and are summarized in Section 4.
(**************************************	Prepare a report summarizing the tasks performed and the potential human health exposure risks associated with the WVSU property based on the data provided, if applicable. If exposure risks cannot be properly evaluated, prepare a summary of additional data/information needed to conduct a proper evaluation. This report includes a summary of the CH2M Hill reports and data reviews, the re-screening of

analytical data available, and the subsequent evaluation on the relevance of a human health exposure risk assessment for the site.

This report is organized into five sections including this section (the Introduction – Section 1). The subsequent sections include:

- Section 2 (Analytical Results and Constituents of Concern): This section presents the analytical results and selection of constituents of concern (COCs).
 Section 3 (Conceptual Site Model): This section presents the conceptual site model (CSM) for the site. The site CSM consists of a hydrogeologic CSM, a preliminary exposure pathway evaluation where select pathways will be qualitatively eliminated from consideration, and a human health CSM.
 Section 4 (Data Gap Analysis): This section presents a data gap analysis and data needs to satisfy those gaps to complete the HHEE.
- ☐ Section 5 (References): This section contains the references cited in this document.

Various tables and attachments are also presented as part of this document and are referenced, where appropriate, in the text.

1.1 Site History and Current Conditions

The WVSU property is located at 5000 Fairlawn Avenue in Institute, Kanawha County, West Virginia. There is limited information provided in the CH2M Hill reports regarding the manufacturing processes and specific chemicals used at the UCC property. This limits the ability to determine that exact source areas on the UCC property and exactly what constituents are expected to be able to migrate to the WVSU property.

According to the WVSU website, WVSU was chartered in 1891. By 1955, the footprint of the university layout was established and many structures were complete that remain to this day. Two historic aerial photographs (1955 and 1971) from the CH2M Hill GW Report are included in Attachment 2. The 1955 aerial photograph appears to show two water impoundments approximately 5 to 7 acres in surface area. The 1971 aerial photograph appears to show these two impoundments filled in with apparent access roads running west towards the Union Carbide Corporation (UCC) property.

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The WVSU property is comprised of an approximately 140-acre roughly rectangular shaped parcel with northeast frontage on Fairlawn Avenue. The ground surface of the site is generally flat floodplain with a mix of grassy lawns, asphalt parking and more than 40 buildings of various sizes. The floodplain slopes slowly to the southwest from Fairlawn to the New York Central Railroad and Kanawha River, which constitute the downgradient property boundary. The former UCC property borders the WVSU property to the northwest. Residential neighborhoods and a golf course abut the site to the southeast. North of Fairlawn Ave. is mixed residential and light commercial properties with no signs of heavy industry or manufacturing. The primary historical use of the site has been college or university-level higher education and the anticipated future use of the site is to remain the same. However, the historic aerial photographs from the CH2M Hill GW Report (included in Attachment 2) show evidence of some industrial use (e.g., filling of impoundments with fly ash) and imply the potential for there to have been additional undocumented industrial use on the WVSU property.

WVSU students reside on-site in dormitories located in the northern portion of the site in Judge Keith Scholars (JKS) Hall and Dawson Hall, and faculty resident housing is located in the southern portion of the site just south of the former impoundments filled in between 1955 and 1971. Other on-site potential receptors include non-resident faculty and staff, non-resident students, and visitors.

There is no reported data on utility lines (e.g. subsurface location and depth). Other than locations of indoor air sampling, no descriptions of below grade basements or crawl spaces were provided.

Groundwater at the site predominantly flows toward the south-southeast in the southern portion of the site. There is no specific hydrogeological data reported for the more northern and eastern portions of the site. The nearest surface water feature to the site is the Kanawha River, which is located at the southwest boundary of the site and is a local discharge feature relative to the site. The 1955 aerial photograph and a 1958 Saint Albans USGS 7.5 min quadrangle map from the GW Report (included in Attachment 2) revealed there were shallow streams running diagonally across the southern portion of the site from approximately north to south flowing into the former impoundments that eventually discharged to the Kanawha River. The 1971 aerial photograph (included in Attachment 2) shows these impoundments appear to have been filled in. A Google Earth

aerial from 1990 (included in Attachment 2) shows no signs of the former impoundment with grassy areas and other development covering those areas. Surface run-off control on the site is uncertain, but is expected to overland flow to storm drain catch basins in the parking lots, roads and other impermeable surfaces, presumably discharging to the river.

1.2 Previous Investigation Summary

A series of phases of environmental investigations of groundwater and air media were completed by CH2M Hill and EnviroProbe reported in the documents listed in Section 1. These investigations stemmed from the premise that dissolved-phase groundwater constituents of potential concern (COPCs) were migrating from the UCC property to the WVSU property, with each phase expanding on prior findings. A summary of the investigations included in those reports and EnviroProbe data, table, and figure provided is below. A brief description of the extent of the investigation, excerpted conclusions from the associated reports or document, and any TMG commentary to the findings are presented below, organized by media with groundwater first, followed by the various components of the vapor intrusion investigation, which was reported separately. TMG assumes that the "grab" (as identified in the CH2M Hill reports) groundwater samples were acceptable for analysis within this report. The discussions below are related to COPCs (and not COCs) in the context of constituent distribution, migration, and prevalence of detections. Further analysis on a comparison of the COPCs to applicable screening criteria to select COCs is discussed below in Section 2.2.

1.2.1 Groundwater

CH2M Hill Phase I – August 2013 – Sixteen grab groundwater samples (which includes 2 duplicate samples) were collected from five temporary well locations in the southwestern portion of the site. (Note that the total number of samples for Phase I was counted based on the data tables presented in the CH2M Hill reports.) These wells were analyzed for the 12 volatile organic compounds (VOCs) and 3 semi-volatile organic compounds (SVOCs) that were detected in the 4 eastern property boundary wells (TW-65A/B and VW-3A/B) on the UCC property.

Conclusions from the CH2M Hill Phase I: COPCs detected on the UCC property may have migrated beneath the WVSU property. Groundwater flow is to the southeast. COPCs were above USEPA Regional Screening Levels/Maximum Contaminant Levels

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(RSLs/MCLs) on the WVSU property but no potable water use was identified and therefore, there is no risk associated with ingestion of drinking water. There were some exceedances of the residential vapor intrusion screening levels (VISLs), but no VOCs were above commercial/industrial vapor intrusion screening levels (VISLs). There are no occupied buildings in the area investigated and no known plans for residential reuse. An environmental covenant should be placed on the WVSU property to prohibit the use of groundwater, require a vapor barrier for newly constructed buildings, and to prohibit residential reuse of the property.

TMG Conclusion: TMG concurs with the Phase I conclusions as they are defined which are limited to the Phase I area (southwestern portion of the WVSU property) investigated.

CH2M Hill Phase II through V - April 2016 - Twenty grab groundwater samples (including 3 duplicate samples) were collected from seven temporary well locations spread across the southern portion of the site and were analyzed for VOCs and SVOCs in Phase II and III. The Phase II groundwater samples were analyzed for the same of list of VOCs and SVOCs as the Phase I groundwater samples. Note however that Phase III samples were only collected for purposes of delineating 1,4-dioxane in groundwater and, therefore, were only analyzed for 1,4-dioxane. In Phase IV, twenty-three groundwater samples were collected (including one duplicate sample) from twelve monitoring wells ("TW" wells) and one existing monitoring well on the UCC property (MW-104). These wells were analyzed for the investigation-specific COPC list of VOCs and SVOCs (i.e. same list as Phase I and II). In Phase V, fourteen groundwater samples were collected from eleven temporary well locations and were analyzed for the investigation-specific COPC list of VOCs and SVOCs, plus target compound list (TCL) SVOCs, polynuclear aromatic hydrocarbons (PAHs), and Resource Conservation and Recovery Act (RCRA) metals at WVSU's request. Many of the Phase V samples were collected within or in the vicinity of the projected former impoundment areas. (Note that the total number of samples for Phases II through V was counted based on the data tables presented in the CH2M Hill reports.)

Conclusions from the CH2M Hill Phase II through V: Hydrogeological data from the monitoring wells installed during the Phase IV investigation confirmed the southeasterly groundwater flow direction across the site that becomes more southerly towards the Kanawha River and are influenced by subsurface hydrogeologic conditions.

Groundwater impacts on the WVSU property appear to have resulted from more than one source for 1,4-dioxane and chloroform specifically (in the southeastern portion of the WVSU property) including the migration of COPCs in groundwater from the UCC property. COPC plumes originating from the UCC property have been delineated. Groundwater data indicate the vapor intrusion pathway is incomplete with the exception of potential future residential-type use (e.g., homes, dormitories, daycare, or other) in the Phase I investigation area. Based on detections of a mixture of naphthalene and 1,2-dichloroethane (1,2-DCA) in the shallow monitoring well TW-107, which is not found elsewhere in shallow groundwater on-site, there is a potential residential exposure to groundwater flowing from the eastern WVSU property boundary to adjacent off-site receptors reportedly unrelated to activities at the UCC property.

TMG Conclusions: Based on visual observations of borings completed in the projected impoundment area reported in the Phase II through V GW Report, it appears the impoundments were filled with fly ash. This conclusion was not specifically stated in the Phase II through V GW Report, although the data and the subsequent Vapor Intrusion Report strongly suggest it. No speculation was made as to the origin of the fly ash, but it is likely from a coal-burning source. TMG generally concurs with the other conclusions drawn as they were defined, except the issue related to the potential residential exposure to groundwater from the eastern WVSU property boundary. This supposition is speculative in that no water-level data are known to have been collected on the adjacent property to support groundwater flow direction toward the property to the east of TW-107, which is also a golf course and not residential.

EnviroProbe Groundwater Sampling Event – September 2016 – Nine monitoring wells (TW-105 through TW-113) on the WVSU property were sampled by EnviroProbe in September 2016. No written explanation of the sampling effort or results was provided with the associated analytical laboratory results. The samples were analyzed for TCL VOCs, SVOCs including PAHs, and RCRA metals. These previously unpublished groundwater results were tabulated and compiled by TMG for detected COPCs only to permit a side-by-side comparison to the CH2M Hill monitoring well groundwater results (see Table 1-1). The TMG comparison is further discussed in Section 2.

TMG Conclusion: The detected VOCs appeared to be generally comparable and consistent between the CH2M Hill and EnviroProbe sampling events. A few VOCs

(chloromethane, bromodichloromethane, and 1,1,1-trichloroethane) that were not on the CH2M Hill's investigation-specific list were detected in one sample each from EnviroProbe. The chloromethane and 1,1,1-trichloroethane concentrations were less than their respective RSLs and VISLs. The single bromodichloromethane detection exceeded both the re-screened tap water RSL and residential VISL. Seven non-carcinogenic PAHs were detected in one sample at concentrations less than their respective tap water RSLs (if available). In general, the EnviroProbe groundwater results showed consistent findings with previous reported results by CH2M Hill. Groundwater data are discussed in more detail in Section 2.1.

1.2.2 Vapor Intrusion/Indoor Air

CH2M Hill Vapor Intrusion – June 2015 and January to February 2016 – The Vapor Intrusion investigation activities occurred in two phases concurrent with Phase IV and V of the groundwater investigation. The Vapor Intrusion investigation, requested by WVSU, focused on four distinct areas (Athletic Facility, Convocation Center, Eastern Area, and Faculty Housing) because each area has different geographic features and a distinct set of data available to evaluate vapor intrusion potential.

The initial phase of Vapor Intrusion investigation in June 2015 included collection of indoor and outdoor (ambient) air samples from the Athletic Facility, Convocation Center, and Faculty Housing Areas. Between two and six samples were collected from each story of each singular building tested. (Note however that because the Convocation Center was built in two stages separated by many years, six indoor air samples were collected from the older part of the building and the newer part of the building for a total of twelve indoor air samples on the ground floor.) The samples were analyzed for a specific subset list of VOCs consisting of 1,1-dichloroethane, 1,1-dichloroethene, 1,4-dioxane, benzene, chlorobenzene, chloroform, and trichlorofluoromethane (TCFM).

A second phase Vapor Intrusion investigation was completed in January and February 2016 in the Faculty Housing area and at the Eastern Area to investigate impacts related to the former impoundments and to address temporal variability. Sixteen exterior soil gas samples were collected (including one duplicate sample and two split samples) at seven locations 5 ft-bgs and just above the water table (approximately 15-20 ft-bgs). A second round of indoor and outdoor air samples were collected at the same locations in the



unoccupied residence in the Faculty Housing Area previously tested. Also, subslab and crawl space air samples were collected from the same unoccupied faculty residence to evaluate entry points for vapor intrusion. The second phase Vapor Intrusion samples were analyzed for a TCL-like list of VOCs to evaluate the potential contribution from the former impoundments.

Conclusions from the CH2M Hill Vapor Intrusion Report: CH2M Hill generally concluded based on multiple lines of evidence examined that there was not a significant Vapor Intrusion source on the WVSU property related to the COPCs in groundwater originating from the UCC property. Specifically, the current Vapor Intrusion potential at the Athletic Facility and Convocation Center was deemed insignificant based on a lack of VISL exceedances in indoor air (highest hierarchy of media for Vapor Intrusion evaluation) and at the Eastern Area based on limited exterior soil gas exceedances. Vapor Intrusion potential was concluded to be insignificant in the unoccupied residence tested in the Faculty Housing Area based on a lack of VISL exceedances in the subslab soil vapor samples indicating there is not a significant source for the Vapor Intrusion pathway. CH2M Hill stated that there were several VOCs in one exterior soil gas sample location (INS-0562) above VISLs, indicating that potential VI risk cannot be ruled out without additional data in occupied structures located within a 100-foot radius of this sample location.

TMG Conclusion: TMG generally concurs with CH2M Hill's conclusions for the Vapor Intrusion Report at the target risk and HQ evaluated. TMG recognizes the exterior soil gas sample exceedances in INS-0562. EnviroProbe performed additional exterior soil gas sampling in August 2016, which assisted to further evaluate vapor intrusion within the area of soil gas point INS-0562. TMG has evaluated the vapor intrusion pathway for the Faculty Housing Area including both CH2M Hill's and EnviroProbe's sample results, which is discussed in Section 3.3.2.

EnviroProbe Exterior Soil Gas Sampling – August 2016 – EnviroProbe installed thirteen shallow (8-10 ft-bgs) vapor points spread across the site including areas in the northern portion of the property not previously evaluated for groundwater or Vapor Intrusion issues and a few in close proximity to CH2M Hill exterior soil gas sampling locations. The northern portion of the property that will be assessed is identified as the Northern Area in subsequent discussions in this report. Ten of the vapor points were

sampled (VP-2, VP-8, and VP-12 were not sampled). The vapor point samples were analyzed for the same TCL-like list of VOCs as CH2M Hill's second Vapor Intrusion phase samples. The only text provided by the WVDEP associated with this sampling event described the vapor point sampling techniques and procedures.

TMG Conclusion: The EnviroProbe exterior soil gas results are somewhat distinctive in comparison to the CH2M Hill exterior soil gas results in that the EnviroProbe results show the same constituents with similar concentrations across a wide aerial extent. VOCs in EnviroProbe exterior soil gas results were detected above VISLs (benzene, naphthalene, and vinyl chloride). Note that these COCs do not exceed applicable VISLs in any CH2M Hill exterior soil gas in any area except for one benzene detection in CH2M Hill exterior soil gas point INS-0572 (5-6') (located within the Convocation Center). Also, these COCs do not exceed applicable VISLs in any CH2M Hill groundwater samples in any area except one detection of benzene in the Athletic Facility area and one detection of naphthalene in the Eastern Area (discussed further in Section 3.3.2).

1.2.3 Summary of WVDEP Provided Reports to Review

Following WVDEP's direction, the reports provided and data collected within those reports were reviewed and considered. TMG generally agrees with the primary conclusions presented by CH2M Hill as they are described in the reports; however, in accordance with the WVDEP Work Directive No. DEP17*07A-1, TMG will perform a separate evaluation using all provided information from CH2M Hill and EnviroProbe. In addition, the analytical data will be re-screened against current applicable standards in order to identify any remaining data gaps.

For instance, TMG agrees that it appears COPCs have migrated in groundwater from the UCC property following a predominant south-southeasterly flow direction that is likely influenced by subsurface conditions, including the fly ash-filled impoundments in the southern portion of the site. However, what is not clear is the source of the fly ash and also what the specific sources are on the UCC property that would indicate what specific constituents have migrated to the WVSU property. However, review of the groundwater analytical data from monitoring wells located in the UCC property (Table A-1 in the 2015 Groundwater Monitoring Report) clearly indicates detectable levels of COPCs



present in monitoring wells in close proximity to the WVSU property boundary. In addition, anecdotal data suggests that the fly ash may have originated from the UCC property. One type of fill placement implies the potential for other historic fill placement, permitted or otherwise.

It is unclear based on the review of the available documentation whether fate and transport modeling has been conducted or proposed in order to support constituent migration from the UCC property to WVSU property and to assist in validating the analytical data collected on the WVSU property. Furthermore, it is also not confirmed that fate and transport modeling has been proposed or completed in order to support diffuse groundwater discharge to the surface water of the Kanawha River. However, evaluation of the Kanawha River and any associated ecological receptors were not part of the WVDEP Work Directive No. DEP17*07A-1 and, therefore, these issues were not considered further in this report.

Based on the criteria CH2M Hill used for assessing the analytical data collected (commercial receptor at 1 x10⁻⁵ target risk and HQ of 1), TMG also concurs with the overall conclusion that for the multiple lines of evidence approach taken for the vapor intrusion evaluation that vapor intrusion may not be significant at the WVSU property. However, as part of this report, TMG will re-screen the available data and perform a further qualitative assessment of the vapor intrusion exposure pathway.

No EnviroProbe reports were provided, so no conclusive statements can be commented upon.

Discussions of the development and assessment of a conceptual site model and data gaps analysis will be presented in Sections 3 and 4 that will allow for completion of a comprehensive HHEE.



2 Analytical Results and Constituents of Concern

All constituents considered related to the UCC property were identified as COPCs. The analytical data in CH2M Hill's reports and the soil gas data table from EnviroProbe were screened using a target carcinogenic risk of 1 x 10⁻⁵ for commercial/industrial and 1 x 10⁻⁶ for residential. Following direction from the WVDEP and because the site is not in the VRP, available data were screened for potable water use and vapor intrusion using USEPA criteria with target carcinogenic risks set at 1 x 10⁻⁶ and noncarcinogenic target risks at a HQ of 0.1 (for both residential and commercial/industrial screening values) to identify constituents of concern (COCs) for potential quantitative analysis. This approach results in a conservative analysis. Any detected COPC that exceeds any of the relevant screening criteria was identified as a COC.

Analytical data tables extracted from the GW and Vapor Intrusion Reports and the EnviroProbe soil gas summary table are presented in Attachment 1. These data tables are presented in their original form and then with a duplicate version containing hand annotated updates to reflect the re-screening requested by the WVDEP. A CH2M Hill modified figure to show all combined site wide groundwater and exterior soil gas sample locations is presented as Figure 2-1.

2.1 Analytical Data and Constituents of Concern

Soil

Review of available reports revealed that no analytical soil quality data were collected. Lithologic soil data were presented in the CH2M Hill GW Report, but no analytical soil sample data were reported. Therefore, no conclusions were able to be made regarding soil quality and vadose zone soil acting as a potential vapor source.

Groundwater

As directed by the WVDEP, groundwater analytical data were re-screened against USEPA tap water RSLs [USEPA 2016a] only (i.e., not MCLs) based on a target carcinogenic risk of 1 x 10⁻⁶ and an HQ of 0.1. In addition, groundwater analytical data were also screened against USEPA OSWER residential and commercial VISL target groundwater concentrations based on a target risk of 1×10⁻⁶ and target HQ of 0.1. These



target groundwater concentrations were calculated using the USEPA VISL Calculator, Version 3.5.1, (based on May 2016 RSLs) [USEPA 2016b].

The cumulative groundwater data for the groundwater investigation activities are presented in two forms. First, the EnviroProbe and CH2M Hill monitoring well groundwater data ("MW" and "TW" groundwater samples) were tabulated and screened as described in the above paragraph. This was completed for two purposes, 1) to make a comparison between the two data sets (CH2M Hill versus EnvrioProbe), and, 2) to select COCs. This monitoring well groundwater data are presented in Table 1-1. Second, groundwater analytical data tables ("INS" groundwater samples) in their original form were extracted from the GW report and re-screened as described in the above paragraph. In addition, these groundwater data tables were reviewed for completeness and accuracy. If any inaccuracies were found, these were hand annotated on the second set of pdf files in Attachment 1 for completeness.

As shown on Table 1-1, with some minor disparities between samples, the two sets of sample results (CH2M Hill versus EnviroProbe) from the monitoring wells are relatively comparable over time. There was one exception related to 1,4-dioxane. The quantitation limit reported for this constituent in the EnviroProbe groundwater samples was 100 ug/L, which was higher than the maximum detected concentration in the CH2M Hill groundwater sample set.

Based on the screening, Table 2-1 presents summary statistics and the selection of direct contact groundwater COC and Table 2-2 presents summary statistics and the selection of vapor intrusion groundwater COC. All groundwater samples from all monitoring wells (site-wide) were included to create Tables 2-1 and 2-2. These tables are also segregated into shallow and deep interval samples. Vapor intrusion was only evaluated in the shallow interval samples, except when only a deep interval groundwater sample was collected from an individual well or grab groundwater sample location. As shown in Table 2-1, there were 12 COC in shallow groundwater and 7 COC in deep groundwater samples that exceeded a tap water RSL. As shown in Table 2-2, there were 10 COC in groundwater that exceeded a residential VISL and 3 COC that exceeded a commercial VISL. Specific monitoring wells located within the areas of concern (e.g. Athletic Facility, Faculty Housing, etc.) will be used in Section 3 to evaluate the vapor intrusion pathway.

With the re-screening for direct contact of groundwater, the same COCs that exceeded criteria in CH2M Hill's groundwater evaluation (1,4-dioxane, naphthalene, 1,1-dichloroethane, and dichlorofluoromethane) remained as COCs, and a few other constituents (1,2-dichloroethane, bromodichloromethane, chlorobenzene, and chloroform) now had one or more individual exceedances in this re-screened data set.

Exterior Soil Gas/Indoor Air/Crawl Space Air/Subslab Air/Ambient Air

The exterior soil gas and subslab analytical data were re-screened against USEPA OSWER residential and commercial VISLs for exterior soil vapor [USEPA 2016b] based on a target carcinogenic risk of 1 x 10⁻⁶ and an HQ of 0.1. The indoor air and crawl space analytical data were re-screened against USEPA OSWER residential and commercial VISLs for indoor air [USEPA 2016b] based on a target carcinogenic risk of 1 x 10⁻⁶ and/or a HQ of 0.1. Exterior soil gas, indoor air, crawl space air, subslab air and ambient air analytical data were used as part of the multiple lines of evidence analysis in conjunction with groundwater for the vapor intrusion pathway analysis. Ambient air analytical results were used to assess the potential for confounding influence on indoor air. Therefore, ambient air samples were not compared to screening criteria.

Maximum detected concentrations of each COPC in the various air media were compared to residential and commercial VISLs to identify vapor intrusion COC. Tables 2-3 through 2-7 present the re-screening statistical summaries for the Athletic Facility Area, Convocation Center Area, Eastern Area, Faculty Housing Area, and Northern Area, respectively. Note that the Athletic Facility and Convocation Center are recreational facilities on the campus and it is noted that some regulatory bodies require this type of building be assessed as a residential scenario. This is a secondary reason why the rescreening of available groundwater and air data was initially done to residential standards to address this potential issue.

Many of the same COCs detected in groundwater samples were also detected in the various air samples. A few new additional COCs were identified and new exceedances of previously identified COCs were observed based on the more conservative screening. Evaluations of the various cumulative air (ambient, indoor, crawl space) and soil gas (sub-slab and exterior) COCs relative to each other are discussed by area in Section 3 including the EnviroProbe exterior soil gas results. The previously unpublished



EnviroProbe soil gas figure presenting sample locations and soil gas COCs with VISL exceedances is presented as Figure 2-2.



3 Conceptual Site Model

This section presents the conceptual site model developed for the site and includes a hydrogeologic CSM, a preliminary exposure pathway evaluation, and a human health CSM.

3.1 Hydrogeologic Conceptual Site Model

The hydrogeological conceptual model in this section was excerpted from the CH2M Hill GW Report with no intent to change the technical hydrogeological interpretation. Components of the hydrogeological interpretation are important to the overall conceptual model as it pertains to migration routes and potential exposure pathways. The unmodified figures from the CH2M Hill GW Report referenced in this section are included in Attachment 2 for completeness and reference.

Groundwater across the investigation area is found at approximately 20 ft-bgs and the bedrock surface is 50 or more ft-bgs. Along the property line between the UCC property and WVSU, groundwater flow is to the south-southeast toward the WVSU property (Attachment 2 - Figure 7). On the WVSU property, groundwater flow becomes southerly, with flow heading toward the Kanawha River.

The direction of groundwater flow along the property line appears to be influenced by the following factors:

- ☐ The presence of thicker, more permeable sands, creating a preferential flow path in the deeper aquifer toward the Kanawha River (Attachment 2 Figures 4 and 5); and.
- ☐ A historical surface water drainage identified on the southern half of the WVSU property that discharged to the Kanawha River (Attachment 2 Figure 6).

Groundwater flow appears to generally follow the alignment of the historical drainage and the underlying thicker, more permeable aquifer at depth. Historically, there were two surface water drainages within the investigation area that were filled in over the years, as indicated on historical aerial photographs and topographic maps. These features are important because they appear to influence subsurface groundwater flow patterns and may influence the presence of COPCs detected in groundwater. In the late 1950s, the northwestern drainage was impounded and two surface water bodies are noted in a



historical photograph from 1955. The extent of these former features is shown on Attachment 2 Figure 6. The artificial impoundments and local drainage were filled in by 1971 based on a historical aerial photograph.

Fill material was reported in the boring logs for eight of the borings installed in the southern portion of the WVSU property. Accumulations of fly ash up to 27 feet were reported in TW-107 and 26 feet in INS-0470.

The shallow and deep 1,4-dioxane and the shallow 1,1-dichloroethene concentration plume figures in the CH2M Hill GW Report (Figures 8, 9 and 11 in Attachment 2) have been used as a "marker" by TMG to depict the apparent extent of COPCs migrating from the UCC property onto the WVSU property.

3.2 Preliminary Exposure Pathway Evaluation

A preliminary evaluation of potential exposure pathways is included in this section to qualitatively eliminate those pathways that are known to be incomplete or determined to result in a negligible or de minimis risk. The following preliminary exposure pathways were considered for evaluation:

Ш	Potable groundwater use;
	Volatilization to trench air and outdoor air exposures;
-	Direct contact soil exposures; and,
	Vapor intrusion indoor air exposures.

3.2.1 Potable Groundwater Use

As reported in the CH2M Hill Phase I Eastern Property Boundary Investigation Report, there are no drinking water wells on-site and no known groundwater potable use on-site. In addition, CH2M Hill recommended that an environmental covenant be placed on the property to prohibit groundwater use on the property. Although there are a number of tap water RSL exceedances in the overburden water-bearing zone on-site, this exposure pathway can be eliminated. *Therefore, no groundwater COCs will be carried through for quantitative risk analysis based on groundwater potable use.* Note, even though groundwater potable use exposure pathways have been deemed incomplete on-site and a covenant has been proposed by CH2M Hill, the potential for groundwater impacts to affect the Kanawha River and downgradient surface water intakes has not been evaluated.



3.2.2 Volatilization to Trench Air and Outdoor Air Exposures

The water table is approximately 20 ft-bgs. Typical trench depths for construction or utility worker scenarios would be 8 to 10 ft-bgs at a maximum. Without knowledge of the soil quality in the shallow subsurface, the difference between the maximum trench depth and the water table depth is expected to result in a negligible potential for volatilization to trench air given the minimum separation distance of 10 feet between the bottom of the trench and water table. The minimum separation distance of 10 feet would allow for significant attenuation capacity. In addition, the maximum concentrations were compared to tap water RSLs based on a target risk of 1 x 10⁻⁶ and HQ of 0.1. However, in actuality, the applicable exposure pathway would be limited to inhalation of volatiles in trench air only (i.e. not potable use exposure pathways).

Furthermore, because of the distance between the water table and the ground surface, volatilization to outdoor air during non-intrusive activities and exposure to ambient air based on the Vapor Intrusion investigation represents a de minimis potential risk. Therefore, these exposure pathways were also eliminated and no quantitative risk analysis will be completed for these exposure pathways.

3.2.3 Direct Contact Soil Exposures

Based on the depth to groundwater, the only potential direct contact exposures would be to soil. *However, since soil quality is unknown, these exposures pathways also cannot be evaluated.*

3.2.4 Vapor Intrusion Indoor Air Exposures

Vapor intrusion exposures to indoor air are considered a complete exposure pathway. The vapor intrusion to indoor air exposure pathway will be evaluated by area in more detail following presentation of the human health CSM and evaluation of migration routes below.

3.3 Human Health Conceptual Site Model

The CSM is a comprehensive view of the site that integrates the various components of the overall environmental setting, including: site geology, hydrogeology, and hydrology; the current distribution and migration of site-related COCs; and potential receptors (both current and future) that may contact site-related COCs through potential exposure



pathways associated with various on-site activities. This HHEE focuses specifically on on-site exposures.

The CSM process was completed in accordance with WVDEP guidance (VRRA 2001). The overall CSM can be broken down into a geologic and hydrogeologic component (e.g. evaluation of transport pathways) and a human health exposure component (e.g. evaluation of exposure pathways). The CSM identifies those potentially complete transport and exposure pathways which may need to be quantitatively evaluated in a site-specific risk assessment to determine whether risk-based benchmarks are met.

Potential constituent migration routes and potential receptors are assessed in this section to determine whether potentially complete exposure pathways exist at the site. An exposure pathway is considered complete if all four of the following elements exist: 1) a potential source of COC; 2) a potential transport mechanism to an exposure medium (this is not needed if the source medium is the exposure medium); 3) contact between a potential receptor and the exposure medium; and, 4) an uptake mechanism associated with the potential receptor.

3.3.1 Potential Constituent Migration Routes

The evaluation of migration routes are based on the detection of constituents and is independent of whether those constituents exceed applicable screening criteria or not.

Following the preliminary evaluation and elimination of certain exposure pathways in Section 3.2, the most likely remaining constituent migration routes are:

- ☐ Groundwater migration from UCC Property to WVSU Property This migration route is retained based on the detections of constituents in groundwater samples from monitoring wells located along the western WVSU property boundary and their potential to continue to migrate further onto the WVSU property.
- □ Soil vapor migration to indoor air This migration route is retained based on the detection of constituents in groundwater samples from wells located within close proximity to existing buildings on-site and exterior soil gas and subslab samples collected within or adjacent to existing on-site buildings.
- ☐ Outdoor air to indoor air There is the potential for outdoor air to influence indoor air quality. This was evaluated using ambient air samples.



Note because there are no vadose zone analytical data to identify the potential for VOC impacts, the contribution of VOCs migrating from soil to soil vapor cannot be assessed.

3.3.2 Vapor Intrusion Exposure Pathway

COCs for the vapor intrusion analysis were evaluated by area in a similar fashion as completed in the CH2M Hill report. Areas include: Athletic Facility Area, Convocation Center Area, Eastern Area, Faculty Housing Area, and Northern Area. As explained in Section 1, the Northern Area was a previously undefined area only sampled by EnviroProbe in the northern portion of the WVSU property. The groundwater and exterior soil gas sampling locations are shown on Figure 2-1. The ambient air, indoor air, crawl space, and subslab soil gas sampling locations are presented in various figures in Attachment 2.

Following USEPA guidance (OSWER Vapor Intrusion Guidance 2015), a multiple lines of evidence approach was followed. COCs were evaluated by using the following hierarchy: indoor air, crawl space, subslab soil gas, exterior soil gas, and groundwater. Additionally, ambient air data were evaluated as a comparative analysis to assist in validating the indoor air data.

Other indoor sources such as chemicals and cleaners used or stored in the building, or construction materials including carpeting, may affect indoor air quality data. These alternate sources of COCs could present confounding variables in the analysis of indoor air. In many cases, it is difficult to discern the difference between these "background" influences and vapor intrusion sources.

COCs are presented in Tables 2-3 through 2-7 for the Athletic Facility Area, Convocation Center Area, Eastern Area, Faculty Housing Area, and Northern Area, respectively. Results of each of these areas is presented in the following sections. Note that COCs qualified due to blank contamination during CH2M Hill's comprehensive data validation process were treated as nondetected results for risk screening. Additionally, split sample results were considered separate but relevant additional sampling results for a sampled location. Field duplicates were not included in the dataset for evaluating vapor intrusion. Finally, samples collected from shallow groundwater depths were considered relevant for vapor intrusion when a sampling location had both a shallow and deep groundwater



sample collected, except in the case when only a deep water sample was collected from a well or grab sample location. In that case, the deep groundwater sample was used to evaluate vapor intrusion.

Athletic Facility Area

Ten indoor air samples (INST-AF-IA01 through INST-AF-IA10), 1 ambient air sample (INST-AF-AA01), 1 exterior soil gas sample (VP-1), and 5 groundwater samples (TW-110 with 2 events, INS-0388, INS-0390, and INS-0467) were collected as part of the vapor intrusion assessment for the Athletic Facility Area. Table 2-3 is a summary of the maximum detected concentrations in samples from the applicable media relevant to the Athletic Facility Area re-screened against current applicable screening criteria. Figure 3-1 is a modified version of Figure 7 from the Vapor Intrusion Report to reflect updates via re-screening.

The following constituents were identified as COCs:

Chloroform (indoor air, groundwater)
Benzene (exterior soil gas, groundwater)
1,1-Dichloroethane (groundwater)
Chlorobenzene (groundwater)

Chloroform

Chloroform was detected in 1 of 10 indoor air samples above the residential VISL in sample location INST-AF-IA04. No other COCs were detected in indoor air above residential screening criteria. Note that chloroform was not detected in the EnviroProbe soil gas sample VP-1 collected near the Athletic Facility. However, VP-1 is located north and sidegradient of the Athletic Facility (i.e. not near groundwater sampling locations INS-0390 and TW-110, located west of the building).

Chloroform was also detected above the residential VISL in groundwater sample INS-0390 and both deep groundwater samples from TW-110. Chloroform also exceeded the commercial VISL in groundwater sample INS-0390. This may suggest a potential vapor

intrusion connection between groundwater in INS-0390 and TW-110 and indoor air. However, groundwater samples from INS-0387 and INS-0389 (located upgradient of the Athletic Facility and closer to the WVSU western property boundary) had no detections of chloroform. Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and the chloroform detection in indoor air was not above the commercial VISL even at the more restrictive target risk (1×10^{-6}) and HQ (0.1) used for screening purposes.

Benzene

Benzene was not detected in any indoor air samples collected from the Athletic Facility. Benzene was identified as a COC in exterior soil gas sample VP-1 located in the Athletic Facility Area. Benzene also exceeded a residential VISL in groundwater at INS-0390. However, benzene was not detected in groundwater samples from INS-0387 and INS-0389 (located upgradient of the Athletic Facility and closer to the WVSU western property boundary). Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and benzene was not detected in indoor air.

1,1-Dichloroethane (1,1-DCA)

1,1-DCA was not detected in any indoor air samples collected from the Athletic Facility. In addition, 1,1-DCA was not detected in exterior soil gas sample VP-1. This constituent exceeded the residential VISL in one groundwater sample from TW-110. 1,1-DCA was not detected in INS-0387 and a detection below the residential VISL in groundwater sample INS-0389 (located upgradient of the Athletic Facility and closer to the WVSU western property boundary). Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and 1,1-DCA was not detected in indoor air.

Chlorobenzene

Chlorobenzene was detected in indoor air, but did not exceed the residential VISL. Chlorobenzene was not detected in exterior soil gas sample VP-1. Chlorobenzene exceeded the residential VISL in groundwater samples from INS-0388 and INS-0390, but was not detected in upgradient groundwater sampling locations INS-0387 and INS-0389. Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and



chlorobenzene did not have any exceedances in indoor air.

Trichlorofluoromethane (TCFM)

There are no USEPA screening criteria available for TCFM. TCFM was detected in every indoor air sample collected from the Athletic Facility and was the only detection reported in the ambient air sample (INST-AF-AA01) collected in the vicinity of the Athletic Facility Area. Because TCFM does not have USEPA screening criteria, there will be no further discussion of TCFM; however, this constituent will remain a COPC (i.e. not a COC).

Note that the Athletic Facility is a recreational facility on the campus and it was noted that some regulatory bodies require this type of building be assessed as a residential scenario, which is one reason why the re-screening of available groundwater and air data was initially done to residential standards to address this potential issue. However, based on the fact that no one resides at the Athletic Facility, commercial screening criteria for assessing whether COCs should be quantitatively evaluated would be considered appropriate. Therefore, no COCs will be carried through for quantitative evaluation for the Athletic Facility Area (see Table 2-3).

Convocation Center Area

Fifteen indoor air samples (INST-CC-IA01 through INST-CC-IA15), 1 crawl space sample location under the steps (INST-CC-CS01), 1 ambient air sample (INST-CC-AA01), 4 exterior soil gas samples (INS-0572 [5-6', 12-13', and 12-13' split sample] and VP-5), and 1 shallow groundwater sample (CH2M Hill sample from TW-106) were collected as part of the vapor intrusion assessment for the Convocation Center Area. Table 2-4 is a summary of the maximum detected concentrations in samples from the applicable media relevant to the Convocation Center Area re-screened against current applicable screening criteria. Figure 3-2 is a modified version of Figure 8 from the Vapor Intrusion Report to reflect updates via re-screening.

The following constituents were identified as COCs:

☐ Chloroform (indoor air);



Benzene (exterior soil gas);
Dichlorodifluoromethane (exterior soil gas, groundwater); and,
Naphthalene (exterior soil gas).

Chloroform

Chloroform was detected in 1 of 15 indoor air samples (INST-CC-IA01 through INST-CC-IA15) above the residential VISL in indoor air sample INST-CC-IA05. Chloroform did not exceed the commercial VISL even at the more restrictive target risk and HQ used for screening purposes. No other COCs were detected in indoor air above residential screening criteria. Chloroform was not detected in the crawl space sample (INST-CC-CS01), any exterior soil gas samples (VP-5 and INS-0572 [5-6' and 12-13']), or the shallow groundwater sample (TW-106, located adjacent to and west of the Convocation Center) relevant to the Convocation Center Area. In addition, chloroform was not detected in any upgradient wells from the Convocation Center Area (i.e. MW-104, TW-104, and TW-108, located west and northwest of the Convocation Center).

Benzene

Benzene was not detected in any indoor air samples or the crawl space sample from the Convocation Center. Benzene exceeded the residential VISL in 2 out of 4 exterior soil gas samples (i.e. VP-5 and INS-0572 [5-6']). This constituent was not detected in the shallow groundwater sample from TW-106 or upgradient wells MW-104, TW-104, and TW-108. Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and benzene did not have any detections in indoor air.

Dichlorodifluoromethane (DCDFM)

DCDFM was not detected in any indoor air samples or the crawl space sample from the Convocation Center. This constituent exceeded the residential VISL in one exterior soil gas sample (INS-0572 [5-6']). DCDFM was not detected in the shallow groundwater sample from TW-106 or upgradient wells MW-104, TW-104, and TW-108. Indoor air takes precedence on the hierarchy of media for vapor intrusion evaluation, and DCDFM did not have any detections in indoor air.



Naphthalene

Naphthalene was not analyzed in any indoor air samples or the crawl space sample from the Convocation Center. Naphthalene exceeded the residential VISL in one exterior soil gas sample (VP-5). Naphthalene was not detected in the exterior soil gas samples from INS-0572. This constituent was not detected in the shallow groundwater sample from TW-106 or upgradient wells MW-104, TW-104, and TW-108. The naphthalene detection in the exterior soil gas sample VP-5 was not above the commercial VISL even at the more restrictive target risk (1 x 10⁻⁶) and HQ (0.1) used for screening purposes.

Trichlorofluoromethane (TCFM)

There are no USEPA screening criteria available for TCFM. TCFM was detected in every indoor air sample collected from the Convocation Center and was the only detection reported in the ambient air sample (INST-CC-AA01) collected in the vicinity of the Convocation Center Area. Because TCFM does not have USEPA screening criteria, there will be no further discussion of TCFM; however, this constituent will remain a COPC (i.e. not a COC).

Note that the Convocation Center is a recreational facility on the campus and it was noted that some regulatory bodies require this type of building be assessed as a residential scenario, which is one reason why the re-screening of available groundwater and air data was initially done to residential standards to address this potential issue. However, based on the fact that no one resides at the Convocation Center, commercial screening criteria for assessing whether COCs should be quantitatively evaluated would be considered appropriate. Therefore, no COCs will be carried through for quantitative evaluation for the Convocation Center Area (see Table 2-4).

Eastern Area

The Eastern Area differs from the other vapor intrusion investigative areas as there are no current enclosed structures that could be regularly occupied by humans. So, this vapor intrusion evaluation is based solely on exterior soil gas and groundwater data on a future structure. Five exterior soil gas samples (INS-0569 [5-6' and 13-14'] and INS-0571 [5-6', 5-6' split sample, and 11-12']), and 2 groundwater samples (CH2M Hill shallow



groundwater sample from TW-107 and shallow grab from INS-0570) were collected as part of the vapor intrusion assessment for the Eastern Area. Table 2-5 is a summary of the maximum detected concentrations in samples from the applicable media relevant to the Eastern Area re-screened against current applicable screening criteria. Figure 3-3 is a modified version of Figure 9 from the Vapor Intrusion Report to reflect updates via rescreening.

The following constituents were identified as COCs:

- □ Naphthalene (groundwater); and,
- □ 1,2-Dichloroethane (groundwater).

Naphthalene

Naphthalene was not detected in any exterior soil gas samples located within the Eastern Area. Naphthalene was not detected in shallow groundwater sample INS-0570, but was detected and exceeded the residential VISL in TW-107. Note that naphthalene did not exceed the commercial VISL in groundwater.

1,2-Dichloroethane (1,2-DCA)

1,2-DCA was not detected in any exterior soil gas samples located within the Eastern Area. 1,2-DCA was not detected in shallow groundwater sample INS-0570, but was detected and exceeded the residential VISL in TW-107. Note that 1,2-DCA did not exceed the commercial VISL in groundwater.

Based on USEPA's vapor intrusion hierarchy, exterior soil gas would have highest precedence in this case. Therefore, no COCs will be carried through for quantitative evaluation for the Eastern Area (see Table 2-5).

Faculty Housing Area

Thirteen indoor air samples (INST-FR-IA01 through INST-FR-IA06 with 2 events each plus a split sample collected in the 2nd event), 2 crawl space samples (INST-FR-CS01 including a split sample), 3 ambient air samples (INST-FR-AA01 with 2 events plus a split sample collected in the 2nd event), 4 subslab soil gas samples (INST-FR-SS01 with 2

events and a split sample on the 2nd event, and INST-FR-SS02), 10 exterior soil gas samples (INS-0560 [5-6' and 16-17'], INS-0562 [5-6' and 11-12'], INS-0564 [5-6' and 17.5-18.5'], INS-0565 [16-17'], VP-1, VP-3, and VP-4), and 5 groundwater samples (TW-111 with 2 events, INS-0465, INS-0559, and INS-0563) were collected as part of the vapor intrusion assessment for the Faculty Housing Area. Table 2-6 is a summary of the maximum detected concentrations in samples from the applicable media relevant to the Faculty Housing Area re-screened against current applicable screening criteria. Figure 3-4 is a modified version of Figure 10 from the Vapor Intrusion Report to reflect updates via re-screening.

The following constituents were identified as COCs:

1,2-Dichloroethane (indoor air, exterior soil gas);
Acrylonitrile (indoor air);
Benzene (indoor air, exterior soil gas, crawl space);
Carbon tetrachloride (indoor air, crawl space);
Chloroform (indoor air, exterior soil gas);
Naphthalene (indoor air, exterior soil gas);
1,2,4-Trimethylbenzene (exterior soil gas);
1,2-Dichloropropane (exterior soil gas);
Trichloroethylene (exterior soil gas);
Vinyl Chloride (exterior soil gas); and,
Benzyl Chloride (crawl space).

Given the complexity of the vapor intrusion analysis for the Faculty Housing Area, a different evaluation was completed for this section. Table 3-1 presents a summary of applicable VISLs exceedances for each media and indicates each location that has an



exceedance.

As discussed previously in this report, the premise for potential vapor intrusion impacts and/or indoor air impacts was the migration of constituents via groundwater flow from the UCC property to the WVSU property. Because no vadose zone soil samples were collected, it is difficult to determine alternative subsurface sources separate from the groundwater acting as a potential subsurface source. In addition, ambient air data were also considered as a potential source for indoor air impacts. Therefore, Table 3-1 shows the following:

- The COCs that were detected in air/soil gas samples either had no detections in groundwater or the COCs were not analyzed in groundwater because they were not considered to be related to the UCC property.
 Two COCs had detections in ambient air samples at equivalent concentrations as found in the indoor air samples.
- ☐ There were either no detections or no exceedances in subslab soil gas samples.
- With no likely groundwater subsurface source beneath the house and apparent similarities between indoor, crawl space, and ambient air samples, this suggests that the COPC (ambient air only) and COC detections in indoor air may be attributed to sources other than vapor intrusion. This could mean other interior background sources. This could also be from an unidentified exterior source other than the dissolved-phase plume that migrated onto the WVSU property. This potential for an unidentified interior or exterior sources could bias the vapor intrusion assessment.

Therefore, no COCs will be carried through for quantitative evaluation for the Faculty Housing Area (see Table 2-6).

Northern Area

Part of the EnviroProbe exterior soil gas sampling program included installation and sampling of 6 vapor point locations in the northern area of the campus away from the groundwater plume and other previous vapor intrusion investigations. These additional



locations appeared to target specific on-site buildings including dormitories (Dawson Hall and Judge Keith Scholars [JKS] Hall) and student gathering locations (Quad and Student Union). VP-6 was used to evaluate the Quad, VP-7 was used to evaluate Dawson Hall, VP-9 and VP-10 were used to evaluate JKS Hall, and VP-11 and VP-13 were used to evaluate the Student Union.

The maximum detected soil gas concentrations from these locations were re-screened against applicable screening criteria and are presented on Table 2-7.

Benzene and naphthalene were the only COCs retained in the Northern Area soil gas points. The following summarizes the exceedances for each building/area in the Northern Area:

- Quad: benzene and naphthalene exceed the residential VISL based on a target risk of 1 x 10^{-6} and target HQ of 0.1. However, these COC do not exceed the commercial VISLs based on a target risk of 1 x 10^{-6} and target HQ of 0.1.
- □ **Dawnson Hall**: benzene and naphthalene exceed the residential VISL based on a target risk of 1 x 10⁻⁶ and target HQ of 0.1. However, these COC would not exceed the residential VISLs based on a target risk of 1 x 10⁻⁵ and target HQ of 1.
- □ **JKS Hall**: benzene and naphthalene exceed the residential and commercial VISL based on a target risk of 1 x 10⁻⁶ and target HQ of 0.1. However, these COC would not exceed the residential VISLs based on a target risk of 1 x 10⁻⁵ and target HQ of 1.
- Student Union: benzene and naphthalene exceed the residential VISL based on a target risk of 1×10^{-6} and target HQ of 0.1. However, these COC do not exceed the commercial VISLs based on a target risk of 1×10^{-6} and target HQ of 0.1.

Finally, there are 4 groundwater sampling locations located close to and south of the Northern Area. These wells are INS-0553, INS-0554, INS-0573, and INS-0574. Only deep groundwater samples were collected from these sampling locations. However, only 1,4-Dioxane was detected in 3 of the 4 deep groundwater samples, but below the residential VISL. Note acetone was detected in INS-0554, but this constituent is believed to be a common lab contaminant. Also, groundwater flow direction from these sampling

locations is south/southeast, flowing away from the Northern Area.

Therefore, no COCs will be carried through for quantitative evaluation for the Northern Area (see Table 2-7).



4 Data Gaps Analysis

In accordance with the Work Directive No. DEP17*07A-1, a data gap analysis has been completed in order to identify critical factors that could potentially affect the conclusions of this HHEE. In some cases, data gaps were identified by CH2M Hill and were considered as part of the evaluation in this report. The following sections specifically identify various data gaps by media.

4.1 Soil

The primary objective of this analysis is to have a comprehensive understanding of potential human health exposures. Therefore, an important data gap was identified to satisfy this objective. The lack of shallow subsurface soil quality data on-site was identified as a data gap. This is based on the premise that alternate sources of COCs may be present in various media (e.g. groundwater and indoor, air). These could have originated from the placement of fill, waste disposal activities, or incidental/accidental spills or releases on-site. Without direct knowledge or evidence to indicate impacts to the vadose zone, it is difficult to assess the potential for these alternate sources to either leach to groundwater to or volatilize to indoor air. In addition, without soil quality data, evaluation of potential direct contact exposures (e.g. ingestion, dermal contact, etc.) with soil is not possible.

CH2M Hill suggested the fly ash-filled in impoundments could be a source of vapor intrusion COCs. It is highly unlikely the VOCs were contained within the fly ash, unless the deposited fly ash had other materials included within its matrix. The primary concern with fly ash would be metals. Anecdotal information suggests the fly ash could have originated from the UCC property from the coal-fired residue burner historically operated on that facility.

4.2 Groundwater

Because there is a lack of soil quality data, there remains a data gap relative to the potential for vadose zone to impact the groundwater and act as an alternative source of COCs in groundwater, soil gas, and indoor air as compared to the COCs that have potentially migrated in groundwater from the UCC property to the WVSU property.



The cumulative groundwater dataset from all CH2M Hill and EnviroProbe investigations resulted in only 1 or 2 events

4.3 Air

The following data gaps were identified for the various air (indoor air, crawl space, and ambient air) and soil gas (exterior soil gas and subslab soil gas) media:

- Some COCs were detected above their respective residential VISLs in groundwater and in exterior soil gas samples but were not analyzed in corresponding indoor air samples. Having different sets of analytical parameters lists among the various media makes it difficult to evaluate the potential migration of COCs from one media to another.
- Only 3 buildings out of 40 plus on-site were evaluated for vapor intrusion. Building on the fact that there is the potential for unidentified deposited material within the vadose zone, there could be potential vapor intrusion issues from vadose zones sources with other buildings on-site that have not been investigated. However, the unoccupied residence in the Faculty Housing area is likely to represent the worst-case on-site residential exposure being closest to the groundwater plume.

4.4 Robustness of the Datasets

Even though no quantitative evaluation for indoor air exposure is recommended, the following elements are a few things that may suggest the potential need for further evaluation:

□ The site has a complex conceptual site model in regards to constituent migration and potential sources of vapor intrusion COCs. The main premise for the various investigations for the presence of COCs on the WVSU property was based on the potential migration of impacted groundwater from the UCC property. However, other than the vapor intrusion sources identified by CH2M Hill, there is the potential for alternate sources of COCs from deposited material in the vadose zone, which may lead to a lack of samples in other potential sources areas.



- There is some disparity in the samples collected from various consultants. For example, the EnviroProbe exterior soil gas samples had unusually consistent results for benzene across all VP samples. Theses VP samples cover a wide area across the WVSU property with unidentifiable potential vapor intrusion sources. Another example is that the EnviroProbe groundwater samples had a high detection limit for 1,4-Dioxane (i.e. <100 ug/L) while the groundwater samples from CH2M Hill had this constituent detected essentially across all groundwater sampling locations. Note that these are only examples and there may be other disparities not mentioned here.
- The analytical datasets from the various consultants present some noted confounding variables. For example, there were detections of constituents in ambient air, where this media has been reported by various regulatory agencies to potentially affect indoor air quality. Note that these are only examples and there may be other confounding variables not mentioned here.
- ☐ There is a limited dataset across all media with generally 1 round of data (2 rounds in some groundwater).

Based on this information, there could be a data gap in regards to the robustness of the analytical dataset. This could potentially affect the overall quality of the datasets and subsequently affect the quality of the CSM and human health exposure analysis. Because of this data gap, only limited conclusions can be drawn for the exposure pathway analysis.



Statement of Limitations

This document is prepared for the West Virginia Department of Environmental Protection (WVDEP) in accordance with Work Directive No. DEP17*07A-1. This report was prepared based on the information supplied by and under direction of the WVDEP. The results of the HHEE presented in this report apply to the existing and reasonably foreseeable site conditions at the time of this assessment. This HHEE is based only on the current site conditions defined by the analytical data and does not assess potential future releases. Changes in the conditions of the property may occur with time due to natural processes or works of man at the site or on adjacent properties. Changes in applicable standards and toxicity criteria may also occur as a result of legislation or the broadening of knowledge. As a result, if any of the exposure assumptions and/or assessment change in the future for this site, the results of this analysis may not apply. The Mahfood Group LLC® is not responsible for the misinterpretation or misuse of this HHEE analysis.



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Tables



Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values

Human Health Exposure Evaluation

West Virginia State University

Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	М	MW-104 IW104-GW-(7/11/201: 23-33 Investigati Shallow CH2M	071115 5 on	TW	TW-102 7/102-GW01 7/9/201: 8.5-12.5 Investigat Shallow CH2M	-070915 5 ion	TW	TW-102 102-GW02-070915 7/9/2015 38-42 Investigation Deep CH2M	TW	TW-103 7103-GW01-070815 7/8/2015 18-22 Investigation Shallow CH2M
Semivolatile Organic Compounds (ug/L)														
1,4-Dioxane	123-91-1	0.46	2900	13000	_	0.85	/Gw		0.59	L/Gw	<	0.2	<	0.21
Isophorone	78-59-1	78	Nav	Nav		1		<	1		<	1	<	1
Naphthalene	91-20-3	0.17	4.6	20	<	0.5		<	0.5		<	0.5	<	0.5
Volatile Organic Compounds (ug/L)														
1,1-Dichloroethane	75-34-3	2.8	7.6	33	<	0.5		<	0.5		<	0.5	<	0.5
1,1-Dichloroethene	75-35-4	28	20	82	<	0.5		<	0.5		<	0.5	<	0.5
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	<	0.5		<	0.5		<	0.5	<	0.5
Acetone	67-64-1	1400	2300000	9500000	<	5		<	5			9.2		6
Benzene	71-43-2	0.46	1.6	6.9	<	0.5		<	0.5		<	0.5	<	0.5
Chlorobenzene	108-90-7	7.8	41	170	<	0.5		<	0.5		<	0.5	<	0.5
Chloroform	67-66-3	0.22	0.81	3.6	<	0.5		<	0.5		<	0.5	<	0.5
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	<	0.5		<	0.5		<	0.5	<	0.5
Ethylbenzene	100-41-4	1.5	3.5	15	<	0.5		<	0.5		<	0.5	<	0.5
Tetrachloroethene	127-18-4	4.1	5.8	24	. <	0.5		<	0.5		<	0.5	<	0.5
Toluene	108-88-3	110	1900	8100	<	0.5		<	0.5		<	0.5	<	0.5
Trichlorofluoromethane	75-69-4	520	Nav	Nav	<	0.5		<	0.5		<	0.5	<	0.5
Additional Detected Constituents from E	nv													
Probe Investigation														
Chloromethane	74-87-3	19	26	110)	NA			NA			NA		NA
Bromodichloromethane	75-27-4	0.13	0.88	3.8	:	NA			NA			NA		NA
1,1,1-Trichloroethane	71-55-6	800	740	3100	ı	NA			NA			NA		NA
Acenaphthene	83-32-9	53	Nav	Nav	-	NA			NA			NA		NA
Acenaphthylene	208-96-8	Nav	Nav	Nav	-	NA			NA			NA		NA
Anthracene	120-12-7	180	Nav	Nav	r	NA			NA			NA		NA
Fluoranthene	206-44-0	80	Nav	Nav	r	NA			NA			NA		NA
Fluorene	86-73-7	29	Nav	Nav	-	NA			NA			NA		NA
Phenanthrene	85-01-8	Nav	Nav	Nav	-	NA			NA			NA		NA
Pyrene	129-00-0	12	Nav	Nav		NA			NA			NA		NA
Criteria Exceeded in Sample						/Gw			/Gw					

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Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values

Human Health Exposure Evaluation

West Virginia State University

Institute, WV

	Sample Name				TW-103	TW-103	TW-104	TW-104
	Sample Position				TW103-GW02-070815	TW103-GW-080115	TW104-GW01-062515	TW104-GW02-062515
	Date Collected				7/8/2015	8/1/2015	6/25/2015	6/25/2015
	Screen Interval				48-52 [1]	47-57	16-20	46-56 [2]
	Sample Type	USEPA	USEPA	USEPA	Investigation	Investigation	Investigation	Investigation
	Shallow/Deep		Residential	Commercial	Deep	Deep	Shallow	Deep
	Company	(ug/L)	VISL (ug/L)	VISL (ug/L)	CH2M	CH2M	СН2М	CH2M
Chemical	CAS No.	Ğw	Vr	Vc				
Semivolatile Organic Compounds (ug/L)								
1,4-Dioxane	123-91-1	0.46	2900	13000	< 0.2	< 0.2	< 0.22	8.5 /Gw
Isophorone	78-59-1	78	Nav	Nav	< 1	< 1	< 1	< 1
Naphthalene	91-20-3	0.17	4.6	20	< 0.5	< 0.5	< 0.5	< 0.5
Volatile Organic Compounds (ug/L)								
1,1-Dichloroethane	75-34-3	2.8	7.6	33	< 0.5	< 0.5	< 0.5	< 0.5
1,1-Dichloroethene	75-35-4	28	20	82	< 0.5	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 0.5	< 0.5	< 0.5	< 0.5
Acetone	67-64-1	1400	2300000	9500000	< 5	< 5	< 5	< 5
Benzene	71-43-2	0.46	1.6	6.9	< 0.5	< 0.5	< 0.5	< 0.5
Chlorobenzene	108-90-7	7.8	41	170	< 0.5	< 0.5	12 /Gw	< 0.5
Chloroform	67-66-3	0.22	0.81	3.6	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	< 0.5	< 0.5	< 0.5	22 /Gw/Vr/Vc
Ethylbenzene	100-41-4	1.5	3.5	15	< 0.5	< 0.5	< 0.5	< 0.5
Tetrachloroethene	127-18-4	4.1	5.8	24		< 0.5	< 0.5	< 0.5
Toluene	108-88-3	110	1900	8100		< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 0.5	< 0.5	< 0.5	< 0.5
Additional Detected Constituents from E	nv							
Probe Investigation								
Chloromethane	74-87-3	19	26	110		NA	NA	NA
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA	NA	NA	NA
1,1,1-Trichloroethane	71-55-6	800	740	3100	NA	NA	NA	NA
Acenaphthene	83-32-9	53	Nav	Nav	NA	NA	NA	NA
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA	NA	NA	NA
Anthracene	120-12-7	180	Nav	Nav	NA	NA	NA	NA
Fluoranthene	206-44-0	80	Nav	Nav	NA	NA	NA	NA
Fluorene	86-73-7	29	Nav	Nav	NA	NA	NA	NA
Phenanthrene	85-01-8	Nav	Nav	Nav	NA NA	NA NA	NA NA	NA NA
Pyrene	129-00-0	12	Nav	Nav	NA	NA	NA	NA
Criteria Exceeded in Sample							/Gw	/Gw/Vr/Vc

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Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values

Human Health Exposure Evaluation

West Virginia State University

Institute, WV

	Sample Name					TW-10-			TW-105		TW-105	l	TW-105		TW-105
	Sample Location				TW	/104-GW-	080115	TW	105-GW01-062515	TV	V105-GW-073115	TV	V105-GW-011416	TW-16	05-GW-011416D
	Date Collected					8/1/201	5		6/25/2015		7/31/2015		1/14/2016		1/14/2016
	Screen Interval					45-55			17-21		48-58		48-58		48-58
	Sample Type	USEPA	USEPA	USEPA		Investigat	ion		Investigation		Investigation		Investigation		Duplicate
		Tapwater RSL	Residential	Commercial		Deep			Shallow		Deep		Deep		Deep
	Company	(ug/L)	VISL (ug/L)	VISL (ug/L)		CH2M			CH2M		СН2М		CH2M		CH2M
Chemical	CAS No.	Ğw	Vr	Vc											
Semivolatile Organic Compounds (ug/L)															
1,4-Dioxane	123-91-1	0.46	2900	13000		3.7	/Gw	<	0.21	<	0.2	<	0.21	<	0.2
Isophorone	78-59-1	78	Nav	Nav	<	1		<	1	<	1	<	1	<	1
Naphthalene	91-20-3	0.17	4.6	20	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
Volatile Organic Compounds (ug/L)															
1,1-Dichloroethane	75-34-3	2.8	7.6	33	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
1,1-Dichloroethene	75-35-4	28	20	82	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
Acetone	67-64-1	1400	2300000	9500000	<	5		<	5	<	5	<	5	<	5
Benzene	71-43-2	0.46	1.6	6.9	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
Chlorobenzene	108-90-7	7.8	41	170	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
Chloroform	67-66-3	0.22	0.81	3.6	<	0.5		<	0.5		3.1 /Gw/Vr	<	0.5	<	0.5
Dichlorodifluoromethane	75-71-8	20	0.74	3.1		1	/Vr	<	0.5	<	0.5	<	0.5	<	0.5
Ethylbenzene	100-41-4	1.5	3.5	15	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
Tetrachloroethene	127-18-4	4.1	5.8	24	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
Toluene	108-88-3	110	1900	8100	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
Trichlorofluoromethane	75-69-4	520	Nav	Nav	<	0.5		<	0.5	<	0.5	<	0.5	<	0.5
Additional Detected Constituents from E	nv														
Probe Investigation															
Chloromethane	74-87-3	19	26	110		NA			NA		NA		NA		NA
Bromodichloromethane	75-27-4	0.13	0.88	3.8		NA			NA		NA		NA		NA
1,1,1-Trichloroethane	71-55-6	800	740	3100		NA			NA		NA		NA		NA
Acenaphthene	83-32-9	53	Nav	Nav		NA			NA		NA		NA		NA
Acenaphthylene	208-96-8	Nav	Nav	Nav		NA			NA		NA		NA		NA
Anthracene	120-12-7	180	Nav	Nav		NA			NA		NA		NA		NA
Fluoranthene	206-44-0	80	Nav	Nav		NA			NA		NA		NA		NA
Fluorene	86-73-7	29	Nav	Nav		NA			NA		NA		NA		NA
Phenanthrene	85-01-8	Nav	Nav	Nav		NA			NA		NA		NA		NA
Pyrene	129-00-0	12	Nav	Nav		NA			NA		NA		NA		NA
Criteria Exceeded in Sample						/Gw/Vr					/Gw/Vr				

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Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values

Human Health Exposure Evaluation

West Virginia State University

Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc		TW-105 TW-105 9/20/2016 48-58 Investigation Deep Env Probe	TV	TW-106 V106-GW01-062515 6/25/2015 17-21 Investigation Shallow CH2M		TW-106 T106-GW- 8/1/201 48-58 Investigat Deep CH2M	080115 5 ion		TW-106 V106-GW-0 1/14/201 48-58 Investigat Deep CH2M	011416 6 ion	Iı	TW-106 TW-106 9/21/201 48-58 avestigati Deep Env Prob	6 ion
Semivolatile Organic Compounds (ug/L) 1.4-Dioxane) 123-91-1	0.46	2900	13000	<	100	<	0.23		2	/Gw		1.7	/GW	<	100	
Isophorone	78-59-1	78	l	Nav	_	NA	<	1	<	1	/GW	<		/GW	_	NA	
Naphthalene	91-20-3	0.17	4.6	20	<	0.11	<	0.6	<	0.5		<	1 0.5		<	0.11	
Volatile Organic Compounds (ug/L)	91-20-3	0.17	4.0	20	_	0.11	_	0.0	_	0.5			0.5		_	0.11	-
1.1-Dichloroethane	75-34-3	2.8	7.6	33	<	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
1.1-Dichloroethene	75-35-4	28		82	`	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
1.2-Dichloroethane	107-06-2	0.17	2.2	9.8	<	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
Acetone	67-64-1	1400	2300000	9500000	<	10.0	<	5	<	5		<	5		<	10.0	
Benzene	71-43-2	0.46	1.6	6.9	<	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
Chlorobenzene	108-90-7	7.8	41	170	<	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
Chloroform	67-66-3	0.22	0.81	3.6	<	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	<	1.0	<	0.5		17	/Vr/Vc		17	J/Vr/Vc		1.2	/Vr
Ethylbenzene	100-41-4	1.5	3.5	15	<	1.0	<	0.5	<	0.5		<	0.5	0	<	1.0	
Tetrachloroethene	127-18-4	4.1	5.8	24	<	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
Toluene	108-88-3	110	1900	8100	<	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
Trichlorofluoromethane	75-69-4	520	Nav	Nav	<	1.0	<	0.5	<	0.5		<	0.5		<	1.0	
Additional Detected Constituents from I	Env																
Probe Investigation																	
Chloromethane	74-87-3	19	26	110		5.2		NA		NA			NA		<	1.0	
Bromodichloromethane	75-27-4	0.13	0.88	3.8	<	1.0		NA		NA			NA		<	1.0	
1,1,1-Trichloroethane	71-55-6	800	740	3100	<	1.0		NA		NA			NA		<	1.0	
Acenaphthene	83-32-9	53	Nav	Nav	<	0.11		NA		NA			NA		<	0.11	
Acenaphthylene	208-96-8	Nav	Nav	Nav	<	0.11		NA		NA			NA		<	0.11	
Anthracene	120-12-7	180	Nav	Nav	<	0.11		NA		NA			NA		<	0.11	
Fluoranthene	206-44-0	80	Nav	Nav	<	0.11		NA		NA			NA		<	0.11	
Fluorene	86-73-7	29		Nav	<	0.11		NA		NA			NA		<	0.11	
Phenanthrene	85-01-8	Nav	Nav	Nav	<	0.11		NA		NA			NA		<	0.11	
Pyrene	129-00-0	12	Nav	Nav	<	0.11		NA		NA			NA		<	0.11	
Criteria Exceeded in Sample					l		1		l	/Gw/Vr/Vc			/Gw/Vr/Vc			/Vr	

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Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values

Human Health Exposure Evaluation

West Virginia State University

Institute, WV

Semivolatile Organic Compounds (ug/L) 1,4-Dioxane 123-91-1 0.46 2900 13000 2.2 L/Gw 0.3 < 100 3.5 /Gw	4.1 /Gw < 1 < 0.5
Sophorone 78-59-1 78	< 1
Naphthalene 91-20-3 0.17 4.6 20 7 /Gw/Vr 13 /Gw/Vr 0.10 0.5 UL Volatile Organic Compounds (ug/L) 1,1-Dichloroethane 75-34-3 2.8 7.6 33 2.5 0.5 1.0 0.5 UL 1,1-Dichloroethane 75-35-4 28 20 82 < 2.5	< 0.5
Volatile Organic Compounds (ug/L) 1,1-Dichloroethane 75-34-3 2.8 7.6 33 < 2.5	
1,1-Dichloroethane	
1,2-Dichloroethane	< 0.5
1,2-Dichloroethane	< 0.5
Benzene 71-43-2 0.46 1.6 6.9 < 2.5 < 0.5 < 1.0 < 0.5 Chlorobenzene 108-90-7 7.8 41 170 < 2.5 < 0.5 < 0.5 < 1.0 < 0.5	< 0.5
Chlorobenzene 108-90-7 7.8 41 170 < 2.5 < 0.5 < 1.0 < 0.5	< 5
	< 0.5
	< 0.5
Chloroform $67-66-3$ 0.2 0.81 3.6 < 2.5 0.7 /Gw < 1.0 < 0.5	< 0.5
Dichlorodifluoromethane 75-71-8 20 0.74 3.1 < 2.5 < 0.5 < 1.0 < 0.5	< 0.5
Ethylbenzene 100-41-4 1.5 3.5 15 < 2.5 < 0.5 < 1.0 < 0.5	< 0.5
Tetrachloroethene 127-18-4 4.1 5.8 24 < 2.5 < 0.5 < 1.0 < 0.5	< 0.5
Toluene 108-88-3 110 1900 8100 < 2.5 < 0.5 < 1.0 < 0.5	< 0.5
Trichlorofluoromethane 75-69-4 520 Nav Nav < 2.5 < 0.5 < 1.0 < 0.5	< 0.5
Additional Detected Constituents from Env	
Probe Investigation Probe Investigation	
Chloromethane	NA
Bromodichloromethane 75-27-4 0.13 0.88 3.8 NA NA NA < 1.0 NA	NA
1,1,1-Trichloroethane	NA
Acenaphthene 83-32-9 53 Nav NA NA 0.36 NA	NA
Acenaphthylene 208-96-8 Nav Nav NA NA 0.86 NA	NA
Anthracene 120-12-7 180 Nav NA NA 0.21 NA	NA NA
Fluoranthene 206-44-0 80 Nav NA NA NA 0.13 NA Fluorene 86-73-7 29 Nav NA NA NA 0.89 NA	NA NA
Fluorene 86-73-7 29 Nav Nav NA NA 0.89 NA Phenanthrene 85-01-8 Nav Nav Nav NA NA 1.5 NA	NA NA
Prienamintene 85-01-8 Nav Nav NA NA 1.5 NA Pyrene 129-00-0 12 Nav Nav NA NA 0.26 NA	I NA
Fyretie	NA.

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Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values

Human Health Exposure Evaluation

West Virginia State University

Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	TW-108 TW108-GW-073115 7/31/2015 45-55 Investigation Deep CH2M		TW-108 TW-108 9/20/2016 45-55 Investigation Deep Env Probe	TV	TW-109 V109-GW- 7/31/201 48-58 Investigat Deep CH2M	073115 5 ion		TW-10 TW-10 9/20/20 48-58 Investiga Deep Env Pro)9 16 } stion
Semivolatile Organic Compounds (ug/L)						4							
1,4-Dioxane	123-91-1	0.46	2900	13000		_ <		_	8	/Gw	<	100	
Isophorone	78-59-1	78	Nav	Nav	< 1		NA	<	I			NA	
Naphthalene	91-20-3	0.17	4.6	20	< 0.5	<	0.10	<	0.5		<	0.11	
Volatile Organic Compounds (ug/L)													
1,1-Dichloroethane	75-34-3	2.8	7.6	33		<	210		0.6		<	1.0	
1,1-Dichloroethene	75-35-4	28	20	82	< 0.5	<		<	0.5		<	1.0	
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	< 0.5	<	210	<	0.5		<	1.0	
Acetone	67-64-1	1400	2300000	9500000	44	<	1010		39			21.8	
Benzene	71-43-2	0.46	1.6	6.9	< 0.5	<	1.0	<	0.5		<	1.0	
Chlorobenzene	108-90-7	7.8	41	170	< 0.5	<	1.0	<	0.5		<	1.0	
Chloroform	67-66-3	0.22	0.81	3.6	< 0.5	<	1.0		2.6	/Gw/Vr		41.9	/Gw/Vr/Vc
Dichlorodifluoromethane	75-71-8	20	0.74	3.1	< 0.5	<	1.0		1.4	/Vr		NA	
Ethylbenzene	100-41-4	1.5	3.5	15	< 0.5	<	1.0	<	0.5		<	1.0	
Tetrachloroethene	127-18-4	4.1	5.8	24	< 0.5	<	1.0	<	0.5		<	1.0	
Toluene	108-88-3	110	1900	8100	< 0.5	<	1.0	<	0.5		<	1.0	
Trichlorofluoromethane	75-69-4	520	Nav	Nav	< 0.5	<	1.0	<	0.5			NA	
Additional Detected Constituents from E	nv												
Probe Investigation													
Chloromethane	74-87-3	19	26	110	NA	<	1.0		NA			5.4	
Bromodichloromethane	75-27-4	0.13	0.88	3.8	NA	<	1.0		NA			3.2	/Gw/Vr
1,1,1-Trichloroethane	71-55-6	800	740	3100		<			NA		<	1.0	
Acenaphthene	83-32-9	53	Nav	Nav	NA	<	01.20		NA		<	0.11	
Acenaphthylene	208-96-8	Nav	Nav	Nav	NA	<			NA		<	0.11	
Anthracene	120-12-7	180	Nav	Nav	NA	<			NA		<	0.11	
Fluoranthene	206-44-0	80	Nav	Nav	NA	<			NA		<	0.11	
Fluorene	86-73-7	29	Nav	Nav	NA	<			NA		<	0.11	
Phenanthrene	85-01-8	Nav	Nav	Nav	NA	<	0120		NA		<	0.11	
Pyrene	129-00-0	12	Nav	Nav	NA	<	0.10		NA		<	0.11	
Criteria Exceeded in Sample					/Gw				/Gw/Vr			/Gw/Vr/Vc	

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Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values

Human Health Exposure Evaluation

West Virginia State University

Institute, WV

Chemical	Sample Name Sample Location Date Collected Screen Interval Sample Type Shallow/Deep Company CAS No.	USEPA Tapwater RSL (ug/L) Gw	USEPA Residential VISL (ug/L) Vr	USEPA Commercial VISL (ug/L) Vc	Т	TW-11 W110-GW 7/31/20 44-54 Investiga Deep CH2M	7-073115 015 4 ation		TW-110 TW-110 9/20/201- 44-54 Investigati Deep Env Prob	6 ion		TW-111 [111-GW-080115 8/1/2015 41.5-51.5 Investigation Deep CH2M	I	TW-111 TW-111 9/20/2016 41.5-51.5 nvestigation Deep Env Probe
Semivolatile Organic Compounds (ug/L)														
1,4-Dioxane	123-91-1	0.46	2900	13000		19	/Gw	<	100			32 /Gw	<	100
Isophorone	78-59-1	78	Nav	Nav	<	1			NA		<	1		NA
Naphthalene	91-20-3	0.17	4.6	20	<	0.5		<	0.10		<	0.5	<	0.10
Volatile Organic Compounds (ug/L)														
1,1-Dichloroethane	75-34-3	2.8	7.6	33		6.9	/Gw		9.1	/Gw/Vr	<	0.5	<	1.0
1,1-Dichloroethene	75-35-4	28	20	82		5	L		7.3		<	0.5	<	1.0
1,2-Dichloroethane	107-06-2	0.17	2.2	9.8	<	0.5	UL	<	1.0		<	0.5	<	1.0
Acetone	67-64-1	1400	2300000	9500000	<	5		<	10.0		<	5	<	10.0
Benzene	71-43-2	0.46	1.6	6.9	<	0.5	UL	<	1.0		<	0.5	<	1.0
Chlorobenzene	108-90-7	7.8	41	170	<	0.5		<	1.0		<	0.5	<	1.0
Chloroform	67-66-3	0.22	0.81	3.6		1.1	L/Gw/Vr		1.8	/Gw/Vr	<	0.5	<	1.0
Dichlorodifluoromethane	75-71-8	20	0.74	3.1		0.6		<	1.0		<	0.5	<	1.0
Ethylbenzene	100-41-4	1.5	3.5	15	<	0.5		<	1.0		<	0.5	<	1.0
Tetrachloroethene	127-18-4	4.1	5.8	24	<	0.5		<	1.0		<	0.5	<	1.0
Toluene	108-88-3	110	1900	8100	<	0.5		<	1.0		<	0.5	<	1.0
Trichlorofluoromethane	75-69-4	520	Nav	Nav		2			3.6		<	0.5	<	1.0
Additional Detected Constituents from E	nv													
Probe Investigation														
Chloromethane	74-87-3	19	26	110		NA		<	1.0			NA	<	1.0
Bromodichloromethane	75-27-4	0.13	0.88	3.8		NA		<	1.0			NA	<	1.0
1,1,1-Trichloroethane	71-55-6	800	740	3100		NA			8.1			NA	<	1.0
Acenaphthene	83-32-9	53	Nav	Nav		NA		<	0.10			NA	<	0.10
Acenaphthylene	208-96-8	Nav	Nav	Nav		NA		<	0.10			NA	<	0.10
Anthracene	120-12-7	180	Nav	Nav	l	NA		<	0.10			NA	<	0.10
Fluoranthene	206-44-0	80	Nav	Nav	l	NA		<	0.10			NA	<	0.10
Fluorene	86-73-7	29	Nav	Nav	l	NA		<	0.10			NA	<	0.10
Phenanthrene	85-01-8	Nav	Nav	Nav	l	NA		<	0.10			NA	<	0.10
Pyrene	129-00-0	12	Nav	Nav		NA		<	0.10			NA	<	0.10
Criteria Exceeded in Sample						/Gw/Vr			/Gw/Vr			/Gw		

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Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values

Human Health Exposure Evaluation

West Virginia State University

Institute, WV

Semivolatile Organic Compounds (ug/L) 1,4-Dioxane 123-91-1 0.46 2900 13000 3 13000 3 13000 13000 3 13000 13000 3 13000 13000 3 13000 13000 3 13000 13000 13000 13000 13000 13000 13000 13000 13000 13000 13000 13000 13000 13000 130000 130000 130000 130000 130000 130000 130000 130000 130000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 1300000 13000000 13000000 13000000 13000000 13000000 13000000 13000000 13000000 13000000 13000000 13000000 13000000 130000000 130000000 130000000 130000000 1300000000 1300000000 13000000000 13000000000 13000000000 13000000000 13000000000 130000000000		Investigation Deep Env Probe	41-51 Investigation Deep CH2M	41-51 Investigation Deep Env Probe
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		< 100	3 10	< 100
Naphthalene 91-20-3 0.17 4.6 20 < 0.5	/Gw <		3 /Gw	
Volatile Organic Compounds (ug/L) 1,1-Dichloroethane 75-34-3 2.8 7.6 33 < 0.5		NA	< 1	NA 0.10
1,1-Dichloroethane 75-34-3 2.8 7.6 33 < 0.5		< 0.11	< 0.5	< 0.10
1,1-Dichloroethene		. 10	0.5	1.0
1,2-Dichloroethane 107-06-2 0.17 2.2 9.8 < 0.5		< 1.0	< 0.5	< 1.0
Acetone 67-64-1 1400 2300000 9500000 < 5 Benzene 71-43-2 0.46 1.6 6.9 <	\ \ \		< 0.5	< 1.0
Benzene 71-43-2 0.46 1.6 6.9 < 0.5 Chlorobenzene 108-90-7 7.8 41 170 < 0.5	<		< 0.5	< 1.0
Chlorobenzene 108-90-7 7.8 41 170 < 0.5	<	2010	< 5	< 10.0
	<	210	< 0.5	< 1.0
	<	1.0	< 0.5	< 1.0
	/Gw <	2.0	< 0.5	< 1.0
Dichlorodifluoromethane 75-71-8 20 0.74 3.1 < 0.5	<		< 0.5	< 1.0
Ethylbenzene 100-41-4 1.5 3.5 15 < 0.5	<	2.0	< 0.5	< 1.0
Tetrachloroethene 127-18-4 4.1 5.8 24 < 0.5	<	2.0	< 0.5	< 1.0
Toluene 108-88-3 110 1900 8100 < 0.5	<		< 0.5	< 1.0
Trichlorofluoromethane 75-69-4 520 Nav Nav < 0.5	<	< 1.0	< 0.5	< 1.0
Additional Detected Constituents from Env				
Probe Investigation Chloromethane 74-87-3 19 26 110 NA		< 1.0	NA	< 1.00
	<			
	<	1.0		1.00
1,1,1-Trichloroethane 71-55-6 800 740 3100 NA	<		NA	< 1.00
Acenaphthene 83-32-9 53 Nav Nav NA	<	****	NA NA	< 0.10
Acenaphthylene 208-96-8 Nav Nav Nav NA	\ \	****	NA NA	< 0.10
Anthracene 120-12-7 180 Nav NA NAv NA Fluoranthene 206-44-0 80 Nav NA NA NA NA NA NA NA N	\ \		NA NA	< 0.10 < 0.10
	<		NA NA	
Fluorene 86-73-7 29 Nav NA NAv NA Phenanthrene 85-01-8 Nav Nav NA NAv NA NAv NA NAv NA NA	<	5 011	NA.	< 0.10
Prienammerie 85-01-8 Nav Nav NA Nav NA Pyrene 129-00-0 12 Nav Nav NA			NTA	0.10
Pyrene 129-00-0 12 Nav Nav NA Criteria Exceeded in Sample //Gw	<	< 0.11	NA NA	< 0.10 < 0.10

Table 1-1

Detected Groundwater Analytical Data From MW-104 and "TW" Monitoring Wells and Comparison to Screening Values Human Health Exposure Evaluation West Virginia State University Institute, WV

Notes:

- L indicates the reported concentration is biased low
- U indicates the constituent was not detected above the reporting detection limit
- UL indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.
- NA not analyzed

Groundwater sample TW-109 was not analyzed for dichlorodifluoromethane and trichlorofluoromethane, which was confirmed by the Pace lab report.

Env Probe groundwater data which was analyzed by Pace Laboratory had a quantitation limit for 1,4-Dioxane of 100 ug/L

It was assumed that the EnviroProbe groundwater samples were collected at the screened interval presented in the assoicated log (i.e. the deep groundwater samples collected by CH2M Hill).

- [1] This interval is located within the screen interval (i.e. 47-57') which is based on the log for TW-103
- [2] This interval is located within the screen interval (i.e. 45-55') which is based on the log for TW-104

Abbreviations used in comparisons:

- /Gw Indicates exceedance of the USEPA tapwater regional screening level (RSL) with a target risk = 1.0E-06 and HQ = 0.1, based on May 2016 RSLs
- /Vr Indicates exceedance of the USEPA residential vapor intrusion screening level (VISL) target groundwater concentration with a target risk 1.0E-06 and HQ = 0.1, based on May 2016 RSLs
- /Vc Indicates exceedance of the USEPA commercial vapor intrusion screening level (VISL) target groundwater concentrations with a target risk of 1.0E-06 and HQ = 0.1, based on May 2016 RSLs

Table 2-1 Groundwater Direct Contact Constituents of Concern

Human Health Exposure Evaluation West Virginia University Institute, WV

СОРС	Shallow Groundwater Maximum Concentration	Shallow Groundwater Maximum Concentration Location	Shallow Groundwater Frequency of Detections	Deep Groundwater Maximum Concentration	Deep Groundwater Maximum Concentration Location	Deep Groundwater Frequency of Detections	Tapwater RSL	Shallow Groundwater Exceed Tapwater (Yes or No)	Deep Groundwater Exceeds Tapwater (Yes or No)	COC carried through to quantitative risk assessment (Yes or No?) - Rationale
Groundwater (ug/L)										
1,4-Dioxane	19.9	INS-0385	20/28	36.7	INS-0390 (42-47')	26/44	0.46	Yes	Yes	No complete exposure pathways
1,1-Dichloroethane	6.44	INS-0467	4/22	12.3	INS-0389 (42-47')	10/46	2.8	Yes	Yes	No complete exposure pathways
1,1-Dichloroethene	2.73	INS-0467	2/22	7.3	TW-110	5/46	28	No	No	No
1,2-Dichloroethane	4.7	TW-107	1/22				0.17	Yes	No	No complete exposure pathways
1,1,1-Trichloroethane				8.1	TW-110	1/9	800	No	No	No
2-Butanone				5.5	INS-0554 (51-55')	1/8	560	No	No	No
Acetone	6	TW-103	1/22	44	TW-108	6/46	1400	No	No	No
Benzene	1.76	INS-0390	1/22	5.3	INS-0388 (42-47')	2/46	0.46	Yes	Yes	No complete exposure pathways
Bromodichloromethane				3.2	TW-109	1/16	0.13	No	Yes	No complete exposure pathways
Chlorobenzene	165	INS-0388	3/22	205	INS-0388 (33.5-43.5')	2/46	7.8	Yes	Yes	No complete exposure pathways
Chloroform	12.2	INS-0390	3/22	41.9	TW-109	14/46	0.22	Yes	Yes	No complete exposure pathways
Chloromethane				5.4	TW-109	2/16	19	No	No	No
Dichlorodifluoromethane				57.2 L	INS-0389 (42-47')	12/46	20	No	Yes	No complete exposure pathways
Ethyl ether	3 K	INS-0559	1/5				390	No	No	No
Naphthalene	7	TW-107	1/22	13	TW-107	1/41	0.17	Yes	Yes	No complete exposure pathways
Tetrachloroethene	30	INS-0555	1/22				4.1	Yes	No	No complete exposure pathways
Trichloroethylene	2.3	INS-0555	1/5				0.28	Yes	No	No complete exposure pathways
Trichlorofluoromethane	26.5	INS-0390	3/22	141	INS-0389 (35-45')	9/24	520	No	No	No
Acenaphthene				0.36	TW-107	1/10	53	No	No	No
Acenaphthylene				0.86	TW-107	1/10	Nav	No	No	No
Anthracene				0.21	TW-107	1/10	180	No	No	No
Fluoranthene				0.13	TW-107	1/10	80	No	No	No
Fluorene				0.89	TW-107	1/10	29	No	No	No
Phenanthrene				1.5	TW-107	1/10	Nav	No	No	No
Pyrene				0.26	TW-107	1/10	12	No	No	No
Arsenic	131	INS-0563	2/4				0.052	Yes	No	No complete exposure pathways
Barium	1580	INS-0566	4/4				380	Yes	No	No complete exposure pathways

Notes:

COPC - constituent of potential concern

COC - constituent of concern

Nav - not available

K - indicates the analyte was positively identified, but the associated numerical value may be biased high.

L - the analyte was positively identified, but the associated numerical value may be biased low.

Only constituents with at least one detection are presented in this table.

USEPA Tapwater Regional Screening Level (RSLs) (TR = 1x10-6 and THQ = 0.1), May 2016.

Table 2-2 Groundwater Vapor Intrusion Constituents of Concern Human Health Exposure Evaluation

West Virginia University Institute, WV

СОРС	Shallow Groundwater Maximum Concentration	Shallow Groundwater Maximum Concentration Location	Shallow Groundwater Frequency of Detections	Deep Groundwater Maximum Concentration	Deep Groundwater Maximum Concentration Location	Deep Groundwater Frequency of Detections	Commercial VISL	Residential VISL	Groundwater Exceeds VISL [1]	COC carried through to quantitative risk assessment (Yes or No?) - Rationale
Groundwater (ug/L)										
1,4-Dioxane	19.9	INS-0385	20/28	36.7	INS-0390 (42-47')	26/44	13000	2900	No	No
1,1-Dichloroethane	6.44	INS-0467	4/22	12.3	INS-0389 (42-47')	10/46	33	7.6	No	No
1,1-Dichloroethene	2.73	INS-0467	2/22	7.3	TW-110	5/46	82	20	No	No
1,2-Dichloroethane	4.7	TW-107	1/22				9.8	2.2	Yes (Res)	No, indoor air media takes precedence
1,1,1-Trichloroethane				8.1	TW-110	1/9	3100	740	No	No
2-Butanone				5.5	INS-0554 (51-55')	1/8	940000	220000	No	No
Acetone	6	TW-103	1/22	44	TW-108	6/46	9500000	2300000	No	No
Benzene	1.76	INS-0390	1/22	5.3	INS-0388 (42-47')	2/46	6.9	1.6	Yes (Res)	No, indoor air media takes precedence
Bromodichloromethane				3.2	TW-109	1/16	3.8	0.88	Yes (Res)	No, indoor air media takes precedence
Chlorobenzene	165	INS-0388	3/22	205	INS-0388 (33.5-43.5')	2/46	170	41	Yes (Res)	No, indoor air media takes precedence
Chloroform	12.2	INS-0390	3/22	41.9	TW-109	14/46	3.6	0.81	Yes (Res and Com)	No, indoor air media takes precedence
Chloromethane				5.4	TW-109	2/16	110	26	No	No
Dichlorodifluoromethane				57.2 L	INS-0389 (42-47')	12/46	3.1	0.74	Yes (Res and Com)	No, indoor air media takes precedence
Ethyl ether	3 K	INS-0559	1/5				Nav	Nav	No	No
Naphthalene	7	TW-107	1/22	13	TW-107	1/41	20	4.6	Yes (Res)	No, indoor air media takes precedence
Tetrachloroethene	30	INS-0555	1/22				24	5.8	Yes (Res and Com)	No, indoor air media takes precedence
Trichloroethylene	2.3	INS-0555	1/5				2.2	0.52	Yes (Res and Com)	No, indoor air media takes precedence
Trichlorofluoromethane	26.5	INS-0390	3/22	141	INS-0389 (35-45')	9/24	Nav	Nav	No	No
Acenaphthene				0.36	TW-107	1/10	Nav	Nav	No	No
Acenaphthylene				0.86	TW-107	1/10	Nav	Nav	No	No
Anthracene				0.21	TW-107	1/10	Nav	Nav	No	No
Fluoranthene				0.13	TW-107	1/10	Nav	Nav	No	No
Fluorene				0.89	TW-107	1/10	Nav	Nav	No	No
Phenanthrene				1.5	TW-107	1/10	Nav	Nav	No	No
Pyrene				0.26	TW-107	1/10	Nav	Nav	No	No

Notes:

COPC - constituent of potential concern

COC - constituent of concern

Nav - not available

K - indicates the analyte was positively identified, but the associated numerical value may be biased high.

L - the analyte was positively identified, but the associated numerical value may be biased low.

Only constituents with at least one detection are presented in this table. (Note that metals are not shown because they are not volatile.)

USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).

[1] Maximum concentrations were determined for shallow and deep overburden groundwater sample was collected from the sample location, then the results from the shallow sample were used to determine vapor intrusion COC. However, if only a deep overburden groundwater sample was collected from the sample location, then the deep overburden groundwater sample was used to select vapor intrusion COC.

Table 2-3 Athletic Facility Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia State University Institute, WV

Athletic Facility:

СОРС	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL		COC carried through to quantitative risk assessment (Y or N)? - Rationale
Ambient Air (ug/m³)							
Trichlorofluromethane	1.18	INST-AF-AA01	1/1				
Indoor Air (ug/m³)							
Chlorobenzene	0.501	INST-AF-IA02	2/10	22	5.2	No	No
Chloroform	0.184	INST-AF-IA04	1/10	0.53	0.12	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Trichlorofluoromethane	1.5	INST-AF-IA06	10/10	Nav	Nav	No	No, no inhalation toxicity available
Exterior Soil Gas (ug/m³) [1]							
Acetone	167	VP-1	1/1	450000	110000	No	No
Benzene	19.4	VP-1	1/1	52	12	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Carbon Disulfide	3.96	VP-1	1/1	10000	2400	No	No
Ethanol	549	VP-1	1/1	Nav	Nav	No	No, no inhalation toxicity available
Trichlorofluoromethane	1.34	VP-1	1/1	Nav	Nav	No	No, no inhalation toxicity available
Dichlorodifluoromethane	1.75	VP-1	1/1	1500	350	No	No
Heptane	1.89	VP-1	1/1	Nav	Nav	No	No, no inhalation toxicity available
N-hexane	2.03	VP-1	1/1	10000	2400	No	No
2-Butanone	3.78	VP-1	1/1	73000	17000	No	No
Propene	126	VP-1	1/1	44000	10000	No	No
Toluene	2.32	VP-1	1/1	73000	17000	No	No
Groundwater (ug/L) [2]							
1,1-Dichloroethane	9.1	TW-110	4/5	33	7.6	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
1,1-Dichloroethene	7.3	TW-110	4/5	82	20	No	No
Benzene	1.76	INS-0390	1/5	6.9	1.6	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Chlorobenzene	165	INS-0388	2/5	170	41	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Chloroform	12.2	INS-0390	4/5	3.6	0.81	Yes (Res and Com)	No, indoor air COCs take precedence
Dichlorodifluoromethane	0.6	TW-110	1/5	3.1	0.74	No	No
Trichlorofluoromethane	26.5	INS-0390	3/5	Nav	Nav	No	No, no inhalation toxicity available
1,1,1-Trichloroethane	8.1	TW-110	1/1	3100	740	No	No
1,4-Dioxane	19	TW-110	4/5	13000	2900	No	No

Notes:

COPC - constituent of potential concern

COC - constituent of concern

J - indicates the reported concentration is estimated.

Nav - not available

Only constituents with at least one detection in the area being evaluated are presented in this table.

Ambient air samples were not compared to screening criteria. These samples were included for qualitative comparison purposes only.

USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).

- [1] VP-1 was included as an exterior soil gas point to evaluate vapor intrusion for the athletic facility.
- [2] Monitoring wells TW-110, INS-0388, INS-0390, and INS-0467 were used to select COC for groundwater within the area of the athletic facility. Note groundwater was sampled at shallow and deep depths within overburden groundwater. If a shallow and deep overburden groundwater sample was collected from the sample location, then the results from the shallow sample were used to determine vapor intrusion COC. However, if only a deep overburden groundwater sample was collected from the sample location, then the deep overburden groundwater sample was used to select vapor intrusion COC.

Table 2-4

Convocation Center Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation

West Virginia State University Institute, WV

Convocation Center:

СОРС	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Ambient Air (ug/m³)							
Trichlorofluoromethane	0.886	INST-CC-AA01	1/1				
Crawl Space (ug/m³)							
Trichlorofluoromethane	5.49	INST-CC-CS01	1/1	Nav	Nav	No	No, no inhalation toxicity available
Indoor Air (ug/m³)							
Chloroform	0.256	INST-CC-IA05	1/15	0.53	0.12	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Trichlorofluoromethane	10.7	INST-CC-IA14	15/15	Nav	Nav	No	No, no inhalation toxicity available
Exterior Soil Gas (ug/m³) [1]							
2-Butanone	30.9	INS-0572-01-012016	2/4	73000	17000	No	No
Acetone	169	VP-5	4/4	450000	110000	No	No
Benzene	38	INS-0572-01-012016	2/4	52	12	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Carbon Disulfide	30.3	VP-5	2/4	10000	2400	No	No
Cyclohexane	1.18	VP-5	1/1	88000	21000	No	No
1,3-Dichlorobenzene	3.46	VP-5	1/4	Nav	Nav	No	No, no inhalation toxicity available
Dichlorodifluoromethane	418	INS-0572-01-012016	4/4	1500	350	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
Ethanol	489	VP-5	1/1	Nav	Nav	No	No, no inhalation toxicity available
Ethylbenzene	6.67	INS-0572-01-012016	1/4	160	37	No	No
4-Ethyltoluene	1.5	VP-5	1/1	Nav	Nav	No	No, no inhalation toxicity available
Heptane	4.12	VP-5	1/1	Nav	Nav	No	No, no inhalation toxicity available
Methylene Chloride	1.72	VP-5	1/4	8800	2100	No	No
m,p-Xylenes	14.9	INS-0572-01-012016	3/4	1500	350	No	No
n-Hexane	55.6	INS-0572-01-012016	2/4	10000	2400	No	No
Naphthalene	8.09	VP-5	1/4	12	2.8	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)
o-Xylenes	5.12	INS-0572-01-012016	3/4	1500	350	No	No
2-Propanol	3.69	VP-5	1/1	2900	700	No	No
Propene	184	VP-5	1/1	44000	10000	No	No
Toluene	27.6	INS-0572-01-012016	2/4	73000	17000	No	No
Trichlorofluoromethane	20.8	INS-0572-01-012016	4/4	Nav	Nav	No	No, no inhalation toxicity available
1,2,4-Trimethylbenzene	1.64	VP-5	1/4	100	240	No	No
Groundwater (ug/L) [2]						1	
No detections							

Notes:

COPC - constituent of potential concern

COC - constituent of concern

Nav - not available

Only constituents with at least one detection in the area being evaluated are presented in this table.

Ambient air samples were not compared to screening criteria. These samples were included for qualitative comparison purposes only.

USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).

- [1] VP-5 was included as an exterior soil gas point to evaluate vapor intrusion for the convocation center.
- [2] Monitoring well TW-106 was used to select COC for groundwater within the area of the convocation center. Note groundwater was sampled at shallow and deep depths within overburden groundwater. If a shallow and deep overburden groundwater sample was collected from the sample location, then the results from the shallow sample were used to determine vapor intrusion COC. However, if only a deep overburden groundwater sample was collected from the sample location, then the deep overburden groundwater sample was used to select vapor intrusion COC.

Table 2-5 Eastern Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia State University Institute, WV

СОРС	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL		COC carried through to quantitative risk assessment (Y or N)? - Rationale	
Exterior Soil Gas (ug/m³)								
1,2,4-Trimethylbenzene	21.4 J	0571-02-012016	3/5	100	24	No	No	
1,3,5-Trimethylbenzene	17 J	0571-01-020516S	3/5	Nav	Nav	No	No	
2-Butanone	24.4	0569-02-011416	3/5	73000	17000	No	No	
Acetone	108 NJ	0569-02-011416	4/5	450000	110000	No	No	
Benzene	4.88 NJ	0569-02-011416	1/5	52	12	No	No	
Carbon Disulfide	3.7 J	0571-01-020516S	1/5	10000	2400	No	No	
Ethylbenzene	5.5 J	0571-01-020516S	2/5	160	37	No	No	
m,p-xylene	25.1	0569-01-011516	2/5	1500	350	No	No	
n-Hexane	13.7 NJ	0569-02-011416	1/5	10000	2400	No	No	
o-xylene	9.5 J	0571-01-020516S	2/5	1500	350	No	No	
Tetrachloroethene	27	0569-02-011416	1/5	580	140	No	No	
Toluene	53.7	0569-02-011416	3/5	73000	17000	No	No	
Trichlorofluoromethane	10.6	0569-02-011416	2/5	Nav	Nav	No	No	
Groundwater (ug/L) [1]								
1,4-Dioxane	2.2	TW-107	1/2	13000	2900	No	No	
Naphthalene	7	TW-107	1/2	20	4.6	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)	
1,2-Dichloroethane	4.7	TW-107	1/2	9.8	2.2	Yes (Res)	No, does not exceed commercial VISL (TR = 1.E-6, THQ = 0.1)	

Notes:

COPC - constituent of potential concern

COC - constituent of concern

Nav - not available

J - The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

NJ - The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

Only constituents with at least one detection in the area being evaluated are presented in this table.

Note there were no soil gas samples (i.e. VP locations) collected within the eastern area during the Envrioprobe investigation.

USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).

[1] Monitoring wells TW-107 and INS-0570 were used to select groundwater COC within the eastern area. Note groundwater was sampled at shallow and deep depths within overburden groundwater. If a shallow and deep overburden groundwater sample was collected from the sample location, then the results from the shallow sample were used to determine vapor intrusion COC. However, if only a deep overburden groundwater sample was collected from the sample location, then the deep overburden groundwater sample was used to select vapor intrusion COC.

1 of 1

Table 2-6 Faculty Housing Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia University Institute, WV

Faculty Housing

Faculty Housing:							
СОРС	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Ambient Air (μg/m³)							
1,1,2-Trichloro-1,2,2-	0.787 J	FR-AA01-012716S	2/2				No
trifluoroethane	0.7673	TK-AA01-012/103	212				INO INC.
2-Butanone	0.663 J	FR-AA1-012616	1/2				No
4-Methyl-2-pentanone	3.3 J	FR-AA1-012616	1/2				No
Acetone	21 J	FR-AA01-012716S	2/2				No
Benzene	0.855 J	FR-AA01-012716S	2/3				No
Carbon tetrachloride	0.752 J	FR-AA01-012716S	1/2				No
Dichlorodifluoromethane	3.75 J	FR-AA01-012716S	2/2				No
Ethylbenzene	0.281 J	FR-AA01-012716S	1/2				No
m,p-xylene	0.755 J	FR-AA01-012716S	2/2				No
Methylene chloride	0.866 J	FR-AA01-012716S	1/2				No
n-hexane	0.649 J	FR-AA1-012616	1/2				No
o-xylene	0.423 J	FR-AA01-012716S	1/2				No
Toluene	0.983 J	FR-AA01-012716S	2/2				No
Trichlorofluoromethane	1.17 J	FR-AA1-012616	2/3				No
Indoor Air (µg/m³)							
1,1,2-Trichloro-1,2,2-							
trifluoroethane	1	FR-IA03-012716S	7/7	13000	3100	No	No
1,1-Dichloroethene	0.213	FR-IA3-06192015	5/13	88	21	No	No
1,2,4-Trimethylbenzene	0.274 J	FR-IA4-012616	4/7	3.1	0.73	No	No
1,2-Dichloroethane	0.25	FR-IA03-012716S	1/7	0.47	0.11	Yes (Res)	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
2-Butanone	1.84	FR-IA2-012716	6/7	2200	520	No	No
4-Methyl-2-pentanone	4.04	FR-IA3-012616	6/7	1300	310	No	No
Acetone	19	FR-IA03-012716S	7/7	14000	3200	No	No
Acrylonitrile	0.236 J	FR-IA03-012716S	1/7	0.18	0.041	Yes (Res and Com)	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
Benzene	0.942	FR-IA2-012716	8/13	1.6	0.36	Yes (Res)	No, maximum concentration not significantly different than AA
Carbon tetrachloride	0.922	FR-IA03-012716S	1/7	2.0	0.47	Yes (Res)	No, maximum concentration not significantly different than AA
Chloroethane	0.223	FR-IA03-012716S	1/7	4400	1000	No	No
Chloroform	0.39	FR-IA03-012716S	1/13	0.53	0.12	Yes (Res)	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
Dichlorodifluoromethane	3.95	FR-IA03-012716S	6/7	44	10	No	No
Ethylbenzene	0.859	FR-IA03-012716S	4/7	4.9	1.1	No	No
m,p-xylene	1.95	FR-IA03-012716S	7/7	44	10	No	No
Methylene chloride	0.731	FR-IA03-012716S	1/7	260	63	No	No
n-hexane	1.69	FR-IA2-012716	6/7	310	73	No	No
Naphthalene	0.736	FR-IA1-012616	1/7	0.36	0.083	Yes (Res and Com)	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
o-xylene	1.31	FR-IA03-012716S	7/7	44	10	No	No
tert-Butyl Methyl ether	0.687 J	FR-IA03-012716S	1/7	47	11	No	No
Tetrachloroethene	0.353	FR-IA03-012716S	1/7	18	4.2	No	No
Toluene	2.35 J	FR-IA03-012716S	7/7	2200	520		No
Trichlorofluoromethane	1.3	FR-IA2-012716	12/13	Nav	Nav	No	No

\mahfoodwhs\tmg\West Virginia Proposal\Risk Assessment Work\West Virginia State University\Tables\ Table 2-6 Facility Housing COC_122016

Table 2-6 Faculty Housing Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia University Institute, WV

Faculty Housing:

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Exterior Soil Gas (µg/m³) [1]							
1,1-Dichloroethane	5.23	0562-01-011416	1/7	260	58	No	No
1,1-Dichloroethene	0.959	VP-3	1/10	2900	700	No	No
Trans-1,2-Dichloroethene	3	VP-3	2/10	Nav	Nav	No	No
1,2,4-Trimethylbenzene	49.4	0564-01-011416	4/10	100	24	Yes (Res)	No, indoor air COCs take precedence
1,2-Dichloroethane	41.6	0562-02-011416	2/7	16	3.6	Yes (Res and Com)	No, indoor air COCs take precedence
1,2-Dichloropropane	747	0562-02-011416	2/7	41	9.4	Yes (Res and Com)	No, indoor air COCs take precedence
1,3-Dichlorobenzene	4.51	VP-4	2/10	Nav	Nav	No	No
1,3,5-Trimethylbenzene	18.1	0564-01-011416	2/10	Nav	Nav	No	No
2-Butanone	9.99	0565-02-011916	5/10	73000	17000	No	No
Acetone	328	VP-4	9/10	450000	110000	No	No
Benzene	78.4	VP-4	6/10	52	12	Yes (Res and Com)	No, indoor air COCs take precedence
Carbon Disulfide	140	VP-3	4/10	10000	2400		No
Carbon tetrachloride	15	0562-01-011416	1/7	68	16	No	No
Chloroform	96.8	0562-01-011416	1/7	18	4.1	Yes (Res and Com)	No, indoor air COCs take precedence
Chloromethane	1.03	VP-3	1/10	1300	310	No	No
Cyclohexane	26.8	VP-3	2/3	88000	21000	No	No
Dichlorodifluoromethane	4.03	VP-4	3/10	1500	350	No	No
Ethanol	549	VP-1	3/3	Nav	Nav	No	No
Ethylbenzene	18.8	0564-01-011416	5/10	160	37	No	No
4-Ethyltoluene	2.44	VP-3	2/3	Nav	Nav	No	No
m,p-xylene	99.8	0564-01-011416	5/10	1500	350	No	No
Heptane	33.3	VP-4	3/3	Nav	Nav	No	No
n-hexane	35.1	0564-01-011416	7/10	10000	2400	No	No
Methylene Chloride	4.15	VP-4	2/10	8800	2100	No	No
n-Propylbenzene	7.15	0564-01-011416	1/7	15000	3500	No	No
Naphthalene	20	VP-4	2/10	12	2.8	Yes (Res and Com)	No, indoor air COCs take precedence
2-Propanol	8.33	VP-4	2/3	2900	700	No	No
o-xylene	30.4	0564-01-011416	5/10	1500	350	No	No
Propene	296	VP-3	3/3	44000	10000	No	No
Styrene	2.29	VP-4	2/10	15000	3500	No	No
Toluene	1060	0565-02-011916	8/10	73000	17000	No	No
Tetrachloroethene	1.52	VP-4	2/10	580	140	No	No
2,2,4-Trimethylpentane	9.68	VP-3	2/3	Nav	Nav	No	No
Trichloroethylene	17.8 J	0560-02-011316	3/7	29	7.0	Yes (Res)	No, indoor air COCs take precedence
Trichlorofluoromethane	307	0565-02-011916	4/10	Nav	Nav	No	No
Vinyl Chloride	11.8	VP-3	2/10	93	5.6	Yes (Res)	No, indoor air COCs take precedence

Table 2-6 Faculty Housing Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia University Institute, WV

Faculty Housing:

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Sub-Slab Soil Gas (µg/m³)							
1,1,2-Trichloro-1,2,2-							
trifluoroethane	0.805 J	FR-SS01-012916S	1/4	440000	100000	No	No
1,2,4-Trimethylbenzene	1.11 J	FR-SS01-012916S	1/4	100	24	No	No
1,4-Dichlorobenzene	0.786 J	FR-SS01-012916S	1/4	37	8.5	No	No
Acetone	26 J	FR-SS01-012916S	2/4	450000	110000	No	No
Benzene	0.674 J	FR-SS01-012916S	1/4	52	12	No	No
Carbon Disulfide	8.8 J	FR-SS01-012916S	1/4	10000	2400	No	No
Carbon tetrachloride	0.763 J	FR-SS01-012916S	1/4	68	16	No	No
Chloroform	0.542 J	FR-SS01-012916S	1/4	18	4.1	No	No
Dichlorodifluoromethane	3.64 J	FR-SS01-012916S	1/4	1500	350	No	No
Ethylbenzene	2.23 J	FR-SS01-012916S	1/4	160	37	No	No
m,p-xylene	7.03 J	FR-SS01-012916S	1/4	1500	350	No	No
Methylene chloride	320 J	FR-SS01-012916S	1/4	8800	2100	No	No
n-hexane	8.8 J	FR-SS01-012916S	1/4	10000	2400	No	No
Naphthalene	0.368 J	FR-SS01-012916S	1/4	12	2.8	No	No
o-xylene	4.03 J	FR-SS01-012916S	1/4	1500	350	No	No
tert-Butyl Methyl ether	0.192 J	FR-SS01-012916S	1/4	1600	360	No	No
Tetrachloroethene	7.45 J	FR-SS01-012916S	1/4	580	140	No	No
Toluene	3.91 J	FR-SS01-012916S	1/4	73000	17000	No	No
Trichlorofluoromethane	19	FR-SS01-020416S	3/4	Nav	Nav	No	No
Crawl Space (μg/m³)							
1,1,2-Trichloro-1,2,2-							
trifluoroethane	0.775	FR-CS01-012716S	2/2	13000	3100	No	No
2-Butanone	1.25 J	FR-CS1-012616	1/2	2200	520	No	No
4-Methyl-2-pentanone	2.33	FR-CS1-012616	1/2	1300	310	No	No
Acetone	18	FR-CS01-012716S	2/2	14000	3200	No	No
Benzene	0.822	FR-CS01-012716S	2/2	1.6	0.36	Yes (Res)	No, maximum concentration not significantly different than AA
Benzyl Chloride	0.218	FR-CS1-012616	1/2	0.25	0.057	Yes (Res)	No exceedances in SS or GW and > 1 x 10-6 residential VISL but < 1 x 10-5 residential VISL
Carbon tetrachloride	0.754	FR-CS01-012716S	1/2	2.0	0.47	Yes (Res)	No, maximum concentration not significantly different than AA
Dichlorodifluoromethane	3.64 J	FR-CS01-012716S	2/2	44	10	No	No
Ethylbenzene	0.504	FR-CS01-012716S	1/2	4.9	1.1	No	No
m,p-xylene	1.32	FR-CS01-012716S	2/2	44	10	No	No
Methylene chloride	4.1	FR-CS01-012716S	1/2	260	63	No	No
n-hexane	0.67	FR-CS1-012616	1/2	310	73	No	No
o-xylene	0.831	FR-CS01-012716S	2/2	44	10	No	No
Toluene	2.12	FR-CS01-012716S	2/2	2200	520 N	No	No No
Trichlorofluoromethane	1.18	FR-CS1-012616	1/2	Nav	Nav	No	No

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Table 2-6 Facility Housing COC_122016

Table 2-6

Faculty Housing Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia University Institute, WV

Faculty Housing:

СОРС	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale
Groundwater (ug/L) [2] 1,4-Dioxane	32	TW-111	4/5	13000	2900	No	No

Notes

AA - Ambient Air

SS - Sub Slab (Air Sample)

GW - Groundwater

Res - Residential

Com - Commercial

VISL - Vapor Intrusion Screening Level

COPC - constituent of potential concern

COC - constituent of concern

Nav - not available

J - The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

Only constituents with at least one detection are presented in this table.

USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).

- [1] Enviroprobe soil gas points VP-1, VP-3, and VP-4 were included to select COC for the faculty housing area.
- [2] Monitoring wells TW-111, INS-0465, INS-0559, and INS-0563 were used to select groundwater COC within the Faculty Housing Area. Note groundwater was sampled at shallow and deep depths within overburden groundwater. If a shallow and deep overburden groundwater sample was collected from the sample location, than the results from the shallow sample only were used to evaluate the COC for VI. However, if only a deep overburden groundwater sample was collected, than the deep overburden groundwater was used to evaluate the COC.

Table 2-7
Northern Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia State University Institute, WV

Soil Gas - EnviroProbe Investigation

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale	
Quad [1]								
2-Butanone	10.2	VP-6	1/1	73000	17000	No	No	
Acetone	115	VP-6	1/1	450000	110000	No	No	
Benzene	24	VP-6	1/1	52	12	Yes (Res)	No, doesn't exceed commercial VISL	
Carbon Disulfide	116	VP-6	1/1	10000	2400	No	No	
Cyclohexane	4.35	VP-6	1/1	88000	21000	No	No	
1,3-Dichlorobenzene	6.98	VP-6	1/1	Nav	Nav	No	No	
Ethanol	1440	VP-6	1/1	Nav	Nav	No	No	
Ethylbenzene	1.76	VP-6	1/1	160	37	No	No	
4-Ethyltoluene	3.12	VP-6	1/1	Nav	Nav	No	No	
Dichlorodifluoromethane	2.14	VP-6	1/1	1500	350	No	No	
Heptane	21.5	VP-6	1/1	Nav	Nav	No	No	
n-Hexane	16.5	VP-6	1/1	10000	2400	No	No	
Methylene Chloride	1.67	VP-6	1/1	8800	2100	No	No	
Naphthalene	10.2	VP-6	1/1	12	2.8	Yes (Res)	No, doesn't exceed commercial VISL	
2-Propanol	11.1	VP-6	1/1	2900	700	No	No	
Propene	649	VP-6	1/1	44000	10000	No	No	
Styrene	2.48	VP-6	1/1	15000	3500	No	No	
Tetrachloroethene	2.39	VP-6	1/1	580	140	No	No	
Toluene	50.6	VP-6	1/1	73000	17000	No	No	
1,2,4-Trimethylbenzene	3.04	VP-6	1/1	100	24	No	No	
1,3,5-Triemthylbenzene	1.04	VP-6	1/1	Nav	Nav	No	No	
2,2,4-Trimethylpentane	2.66	VP-6	1/1	Nav	Nav	No	No	
m,p-Xylene	5.4	VP-6	1/1	1500	350	No	No	
o-Xylene	2.32	VP-6	1/1	1500	350	No	No	
Trichlorofluoromethane	1.96	VP-6	1/1	Nav	Nav	No	No	

Notes on last page

Table 2-7
Northern Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia State University Institute, WV

Soil Gas - EnviroProbe Investigation

СОРС	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale	
Dawnson Hall [2]								
2-Butanone	9.52	VP-7	1/1	73000	17000	No	No	
Acetone	199	VP-7	1/1	450000	110000	No	No	
Benzene	30.3	VP-7	1/1	52	12	Yes (Res)	No, $> 1 \times 10$ -6, but $< 1 \times 10$ -5 residential VISL	
Carbon Disulfide	384	VP-7	1/1	10000	2400	No	No	
Cyclohexane	5.6	VP-7	1/1	88000	21000	No	No	
1,3-Dichlorobenzene	6.54	VP-7	1/1	Nav	Nav	No	No	
Ethanol	1330	VP-7	1/1	Nav	Nav	No	No	
4-Ethyltoluene	1.88	VP-7	1/1	Nav	Nav	No	No	
Dichlorodifluoromethane	2.31	VP-7	1/1	1500	350	No	No	
Heptane	7.47	VP-7	1/1	Nav	Nav	No	No	
n-Hexane	30.4	VP-7	1/1	10000	2400	No	No	
Methylene Chloride	2.23	VP-7	1/1	8800	2100	No	No	
Naphthalene	10.9	VP-7	1/1	12	2.8	Yes (Res)	No, $> 1 \times 10$ -6, but $< 1 \times 10$ -5 residential VISL	
2-Propanol	4.66	VP-7	1/1	2900	700	No	No	
Propene	1210	VP-7	1/1	44000	10000	No	No	
Styrene	0.859	VP-7	1/1	15000	3500	No	No	
Toluene	9.52	VP-7	1/1	73000	17000	No	No	
1,2,4-Trimethylbenzene	1.99	VP-7	1/1	100	24	No	No	
2,2,4-Trimethylpentane	5.37	VP-7	1/1	Nav	Nav	No	No	
m,p-Xylene	2.05	VP-7	1/1	1500	350	No	No	
Trichlorofluoromethane	1.86	VP-7	1/1	Nav	Nav	No	No	

Notes on last page

Table 2-7 Northern Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia State University Institute, WV

Soil Gas - EnviroProbe Investigation

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale	
JKS Hall ^[3]								
2-Butanone	6.48	VP-9	2/2	73000	17000	No	No	
Acetone	295	VP-9	2/2	450000	110000	No	No	
Benzene	57.5	VP-9	2/2	52	12	Yes (Res and Com)	No, $> 1 \times 10$ -6, but $< 1 \times 10$ -5 residential VISL	
Carbon Disulfide	602	VP-9	2/2	10000	2400	No	No	
Chloromethane	1.15	VP-10	1/2	1300	310	No	No	
Cyclohexane	7.86	VP-9	2/2	88000	21000	No	No	
1,3-Dichlorobenzene	7.48	VP-9	2/2	Nav	Nav	No	No	
Ethanol	697	VP-9	2/2	Nav	Nav	No	No	
Ethylbenzene	1.1	VP-9	1/2	160	37	No	No	
4-Ethyltoluene	2.35	VP-9	2/2	Nav	Nav	No	No	
Dichlorodifluoromethane	2.32	VP-9	2/2	1500	350	No	No	
Heptane	18.3	VP-9	2/2	Nav	Nav	No	No	
n-Hexane	38.6	VP-9	2/2	10000	2400	No	No	
Methylene Chloride	4.01	VP-10	2/2	8800	2100	No	No	
Naphthalene	15.2	VP-9	2/2	12	2.8	Yes (Res and Com)	No, $> 1 \times 10$ -6, but $< 1 \times 10$ -5 residential VISL	
Propene	1040	VP-9	2/2	44000	10000	No	No	
Styrene	0.925	VP-9	1/2	15000	3500	No	No	
Tetrachloroethene	1.82	VP-9	1/2	580	140	No	No	
Toluene	21.3	VP-9	2/2	73000	17000	No	No	
1,2,4-Trimethylbenzene	2.43	VP-9	2/2	100	24	No	No	
2,2,4-Trimethylpentane	7.08	VP-9	2/2	Nav	Nav	No	No	
m,p-Xylenes	3.35	VP-9	2/2	1500	350	No	No	
o-Xylenes	1.22	VP-9	1/2	1500	350	No	No	
Trichlorofluoromethane	22	VP-10	2/2	Nav	Nav	No	No	

Notes on last page

Table 2-7

Northern Area Vapor Intrusion Constituents of Concern

Human Health Exposure Evaluation West Virginia State University Institute, WV

Soil Gas - EnviroProbe Investigation

COPC	Maximum Concentration	Maximum Concentration Location	Frequency of Detections	Commercial VISL	Residential VISL	Exceeds VISL (Yes or No?)	COC carried through to quantitative risk assessment (Y or N)? - Rationale	
Student Union [4]								
2-Butanone	10.1	VP-11	1/2	73000	17000	No	No	
Acetone	73.7	VP-11	2/2	450000	110000	No	No	
Benzene	18.8	VP-11	2/2	52	12	Yes (Res)	No, doesn't exceed commercial VISL	
Carbon Disulfide	112	VP-11	2/2	10000	2400	No	No	
Chlorobenzene	1.5	VP-13	1/2	730	170	No	No	
Cyclohexane	8.47	VP-13	2/2	88000	21000	No	No	
1,3-Dichlorobenzene	2.95	VP-11	2/2	Nav	Nav	No	No	
Ethanol	451	VP-11	2/2	Nav	Nav	No	No	
Ethylbenzene	1.17	VP-13	1/2	160	37	No	No	
4-Ethyltoluene	1.92	VP-13	2/2	Nav	Nav	No	No	
Dichlorodifluoromethane	2.8	VP-13	2/2	1500	350	No	No	
Heptane	7.55	VP-13	2/2	Nav	Nav	No	No	
n-Hexane	17.2	VP-13	2/2	10000	2400	No	No	
Methylene Chloride	4.1	VP-11	2/2	8800	2100	No	No	
Naphthalene	10.8	VP-13	1/2	12	2.8	Yes (Res)	No, doesn't exceed commercial VISL	
Propene	66.7	VP-13	2/2	44000	10000	No	No	
Toluene	13.4	VP-13	2/2	73000	17000	No	No	
1,2,4-Trimethylbenzene	1.95	VP-13	1/2	100	24	No	No	
2,2,4-Trimethylpentane	6.64	VP-13	2/2	Nav	Nav	No	No	
Vinyl Chloride	0.917	VP-13	1/2	93	5.6	No	No	
m,p-Xylenes	4.88	VP-13	1/2	1500	350	No	No	
o-Xylenes	2.54	VP-13	1/2	1500	350	No	No	
Trichlorofluoromethane	27.6	VP-11	2/2	Nav	Nav	No	No	

Notes:

COPC - constituent of potential concern

COC - constituent of concern

Nav - not available

Only constituents with at least one detection in the area being evaluated are presented in this table.

USEPA commercial and residential Vapor Intrusion Screening Levels (VISLs) were based on the May 2016 RSLs (TR = 1x10-6 and THQ = 0.1).

- [1] To evaluate the quad soil gas point VP-6 was used to select vapor intrusion COCs.
- [2] To evaluate Dawnson Hall (i.e. dormitory) soil gas point VP-7 was used to select vapor intrusion COCs.
- [3] To evaluate JKS Hall (i.e. dormitory) soil gas points VP-9 and VP-10 were used to select vapor intrusion COCs
- [4] To evaluate the Student Union soil gas points VP-11 and VP-13 were used to select vapor intrusion COCs.

Table 3-1

Faculty Housing Area COC Location Summary by Media

Human Health Exposure Evaluation West Viriginia State University

Institute, WV

Constituent	Ambient Air [1]	Indoor Air	Crawl Space	Subslab Soil Gas	Exterior Soil Gas	Groundwater
			_		0562-01-011416	
1,2-Dichloroethane	ND	FR-IA03-012716S	ND	ND	0562-02-011416	ND
Acrylonitrile	ND	FR-IA03-012716S	ND	ND	ND	NA
		FR-IA1-012616				
		FR-IA2-012716				
		FR-IA3-06192015				
		FR-IA3-012616				
		FR-IA03-012716S				
		FR-IA4-06192015			VP-1	
	FR-AA1-012616	FR-IA4-012616	FR-CS1-012616		VP-3	
Benzene	FR-AA01-012716S	FR-IA5-012616	FR-CS01-012716S	NE	VP-4	ND
Carbon tetrachloride	FR-AA01-012716S	FR-IA03-012716S	FR-CS01-012716S	NE	NE	ND
Chloroform	ND	FR-IA03-012716S	ND	NE	0562-01-011416	ND
					VP-3	
Naphthalene	ND	FR-IA1-012616	ND	NE	VP-4	ND
					0564-01-011416	
1,2,4-Trimethylbenzene	ND	NE	ND	NE	0560-01-011416	ND
					0562-02-011416	
1,2-Dichloropropane	ND	ND	ND	ND	0562-01-011416	NA
					0560-02-011316	
					0560-01-011416	
Trichloroethylene	ND	ND	ND	ND	0562-02-011416	ND
					VP-3	
Vinyl Chloride	ND	ND	ND	ND	VP-4	ND
Benzyl Chloride	ND	ND	FR-CS1-012616	ND	ND	NA

Notes:

[1] Ambient air samples were not compared to screening criteria. The locations presented in the ambient air column are locations that have detections of the constituent.

ND - non-detect

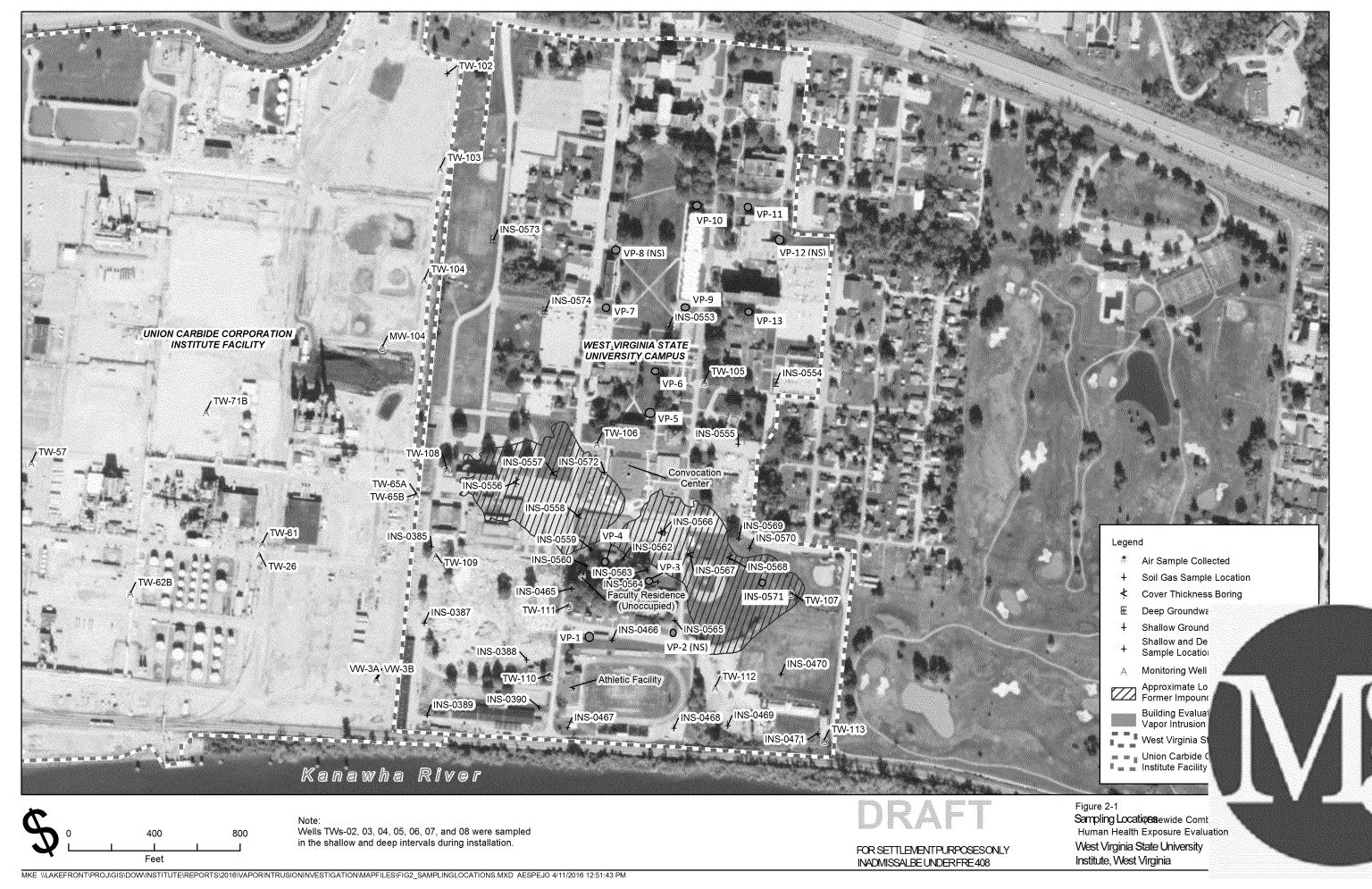
NE - no exceedance of applicable screening criteria

NA - not analyzed

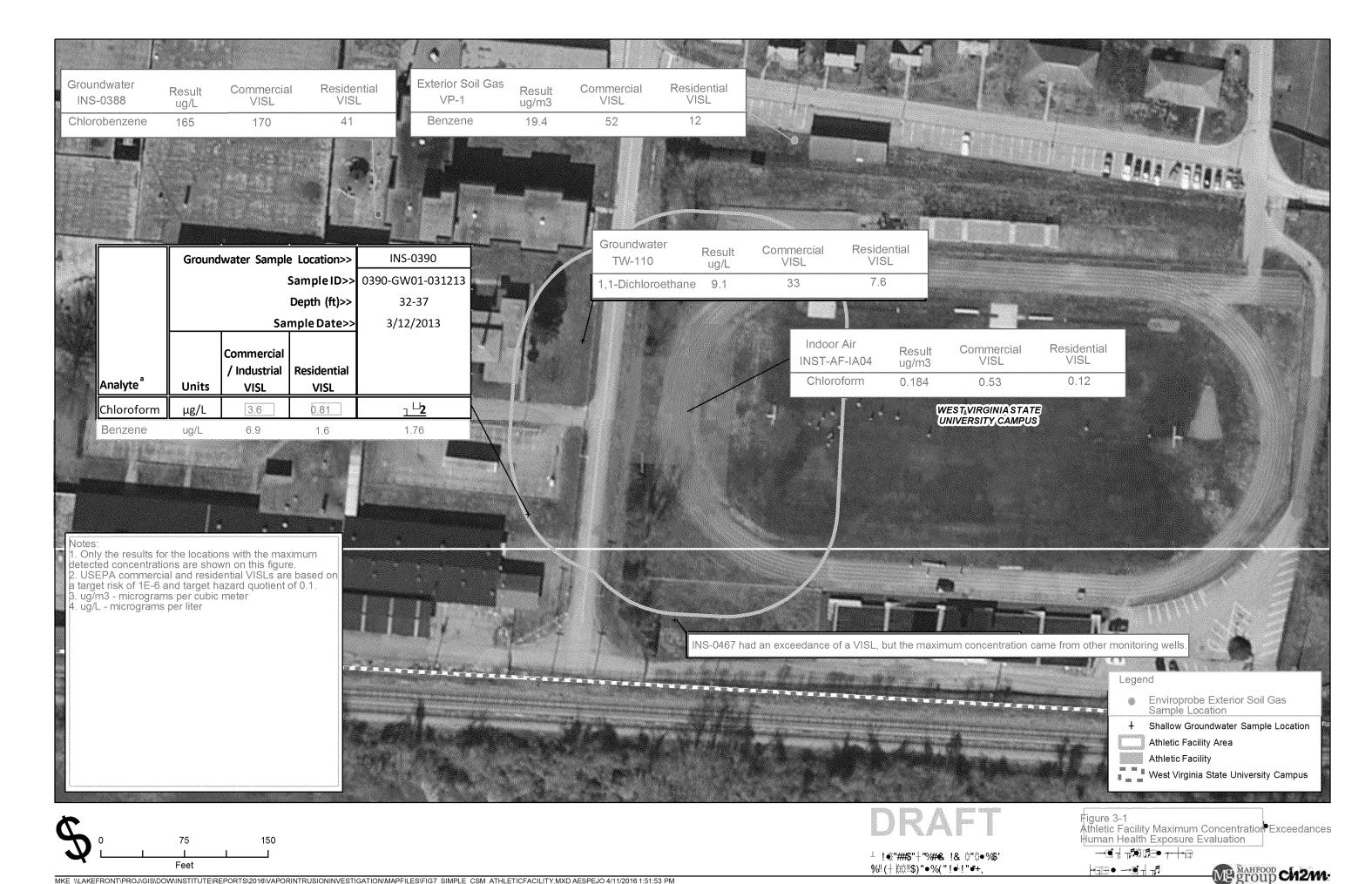
Sample IDs are presented exactly as they were presented in the data tables from the CH2M Hill reports.

Figures

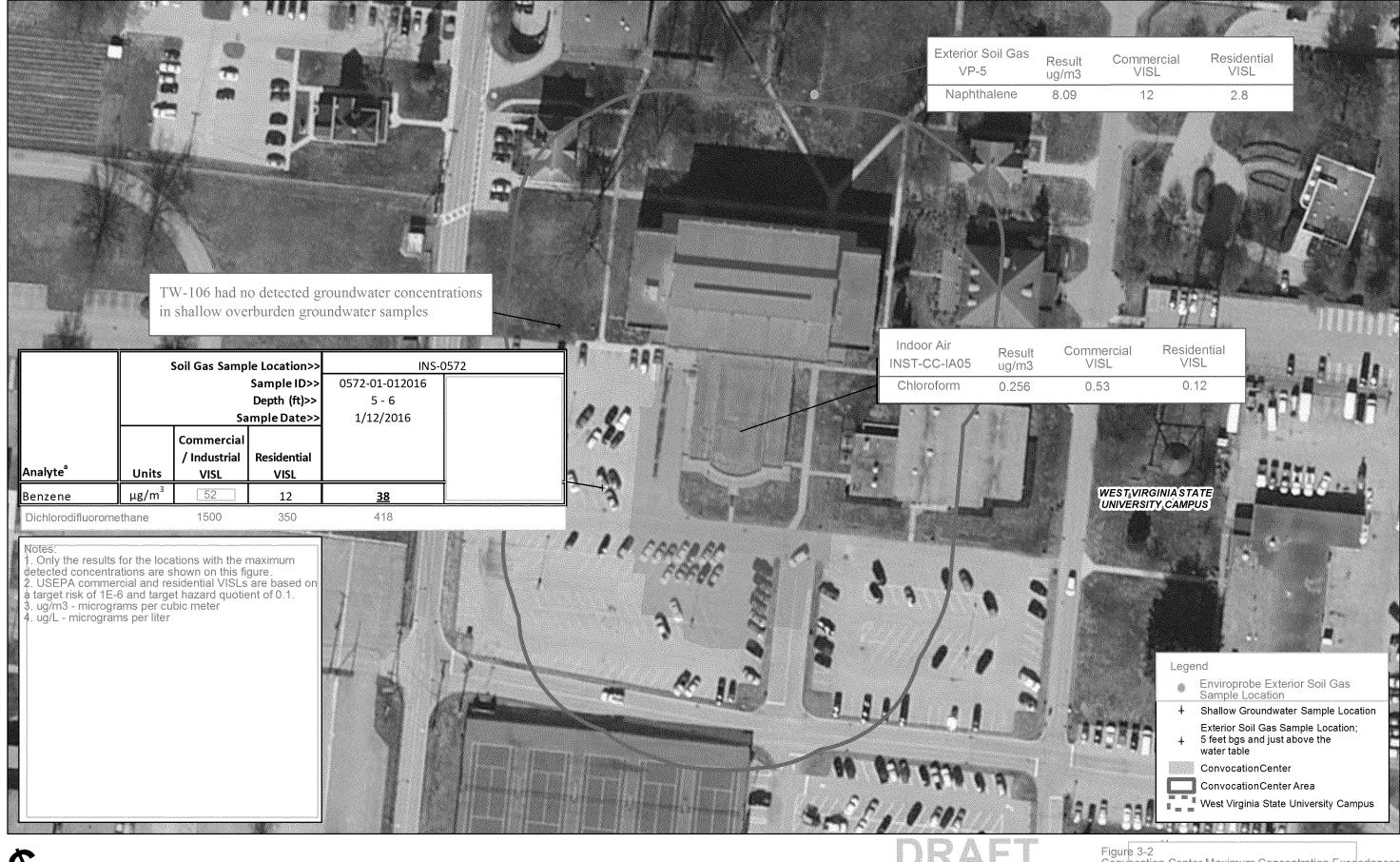








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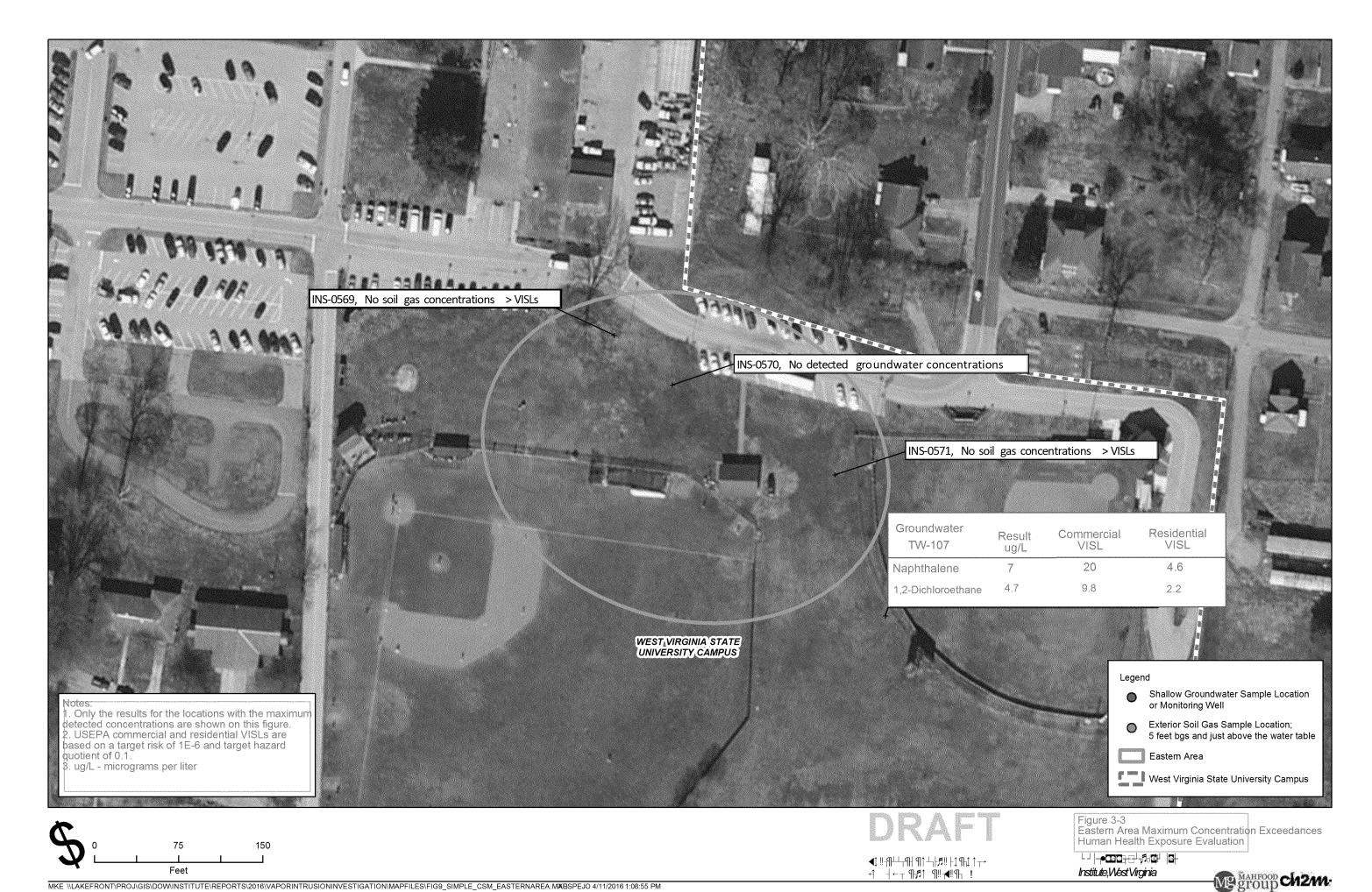


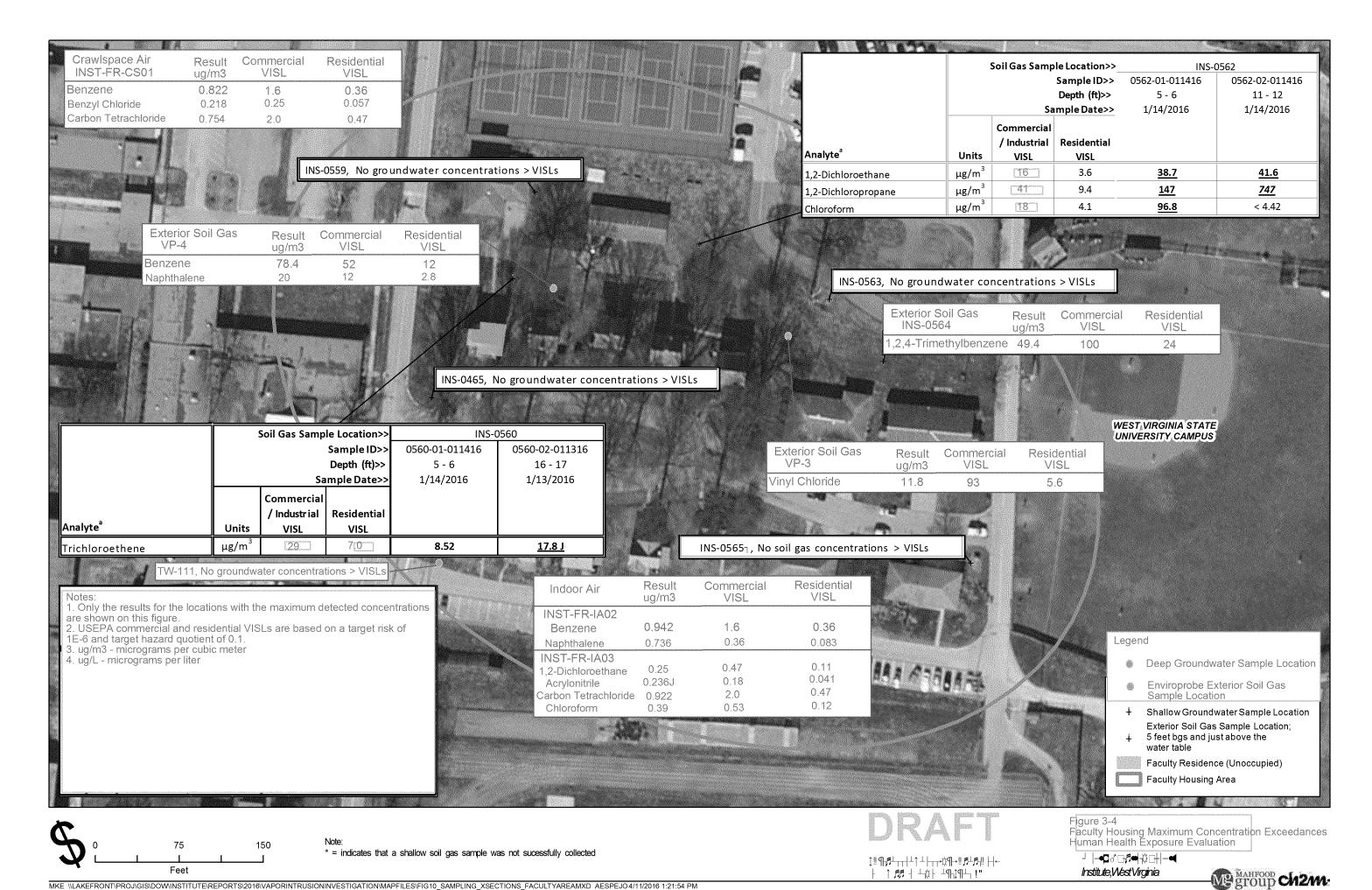
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Figure 3-2 Convocation Center Maximum Concentration Exceedances Human Health Exposure Evaluation

→ | 10-131-10:00 + 131 9 TO / 100cd → 100cm







Attachment 1

Original and Manually Re-screened Groundwater and Air Sample Data



Original Copies of CH2M Hill Groundwater Analytical Data Phases I through V

Table 1. Summary of Phase I Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow In	terval Re	esults			
				Location>>	INS-0385		INS-0387		INS-0388	
				Sample ID>>	0385-GW01-031513		0387-GW01-031413		0388-GW01-031413	
				Depth (ft)>>	27 - 32		30 - 35		32 - 37	
			Sa	mple Date>>	3/15/2013		3/14/2013		3/14/2013	
			RBSLs	-						
			Commercial/							
_				Residential						
Analyte ^a	Units	MCL / RSL	VISL	VISL		RL		RL		RL
svoc										
1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	19.9	10.9	1.1 UJ	1.1	2.87 J	1.1
Isophorone	μg/L	78	NA	NA	5.43 U	5.43	5.49 U	5.43	5.56 U	5.49
Naphthalene	μg/L	0.17	310	7.2	5.43 U	5.43	5.49 U	5.43	5.56 U	5.49
voc										
1,1-Dichloroethane	μg/L	2.8	430	9.9	3.29	1	1 U	1	1 U	1
1,1-Dichloroethene	μg/L	7	1000	240	1 U	1	1 U	1	1 U	1
1,2-Dichloroethane	μg/L	5	130	30	1 U	1	1 U	1	1 U	1
Acetone	μg/L	1400	120000000	29000000	5 U	5	5 UL	5	5 U	5
Benzene	μg/L	5	92	2.1	1 U	1	1 U	1	1 U	1
Chlorobenzene	μg/L	100	2400	570	1 U	1	1 U	1	165	1
Chloroform	μg/L	80	46	1.1	<u>4.46</u>	1	1 U	1	1 U	1
Dichlorodifluoromethane	μg/L	20	41	9.9	1 U	1	1 U	1	1 U	1
Ethylbenzene	μg/L	700	220	49	1 U	1	1 U	1	1 U	1
Tetrachloroethene	μg/L	5	340	21	1 U	1	1 U	1	1 U	1
Toluene	μg/L	1000	110000	26000	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	μg/L	520	NA	NA	8.55	1	1 U	1	1 U	1

Page 1 of 5

Table 1. Summary of Phase I Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

Onion Carbide Corporation, I		,,	,		ow Interval Results			
				Location>>	INS-0389		INS-0390	
				Sample ID>>	0389-GW01-031313		0390-GW01-031213	
				Depth (ft)>>	32 - 37		32 - 37	
			:	Sample Date>>	3/13/2013		3/12/2013	
			RBSLs	-				
			Commercial/					
			Industrial	Residential				
Analyte ^a	Units	MCL / RSL	VISL	VISL		RL		RL
svoc								
1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	3.71 J	1.09	7.08 J	1.11
Isophorone	μg/L	78	NA	NA	5.43 U	5.43	5.56 U	5.56
Naphthalene	μg/L	0.17	310	7.2	5.43 U	5.43	5.56 U	5.56
voc								
1,1-Dichloroethane	μg/L	2.8	430	9.9	1.88	1	2.67	1
1,1-Dichloroethene	μg/L	7	1000	240	1 U	1	1.45	1
1,2-Dichloroethane	μg/L	5	130	30	1 U	1	1 U	1
Acetone	μg/L	1400	120000000	29000000	5 U	5	5 U	5
Benzene	μg/L	5	92	2.1	1 U	1	1.76	1
Chlorobenzene	μg/L	100	2400	570	1 U	1	64.8	1
Chloroform	μg/L	80	46	1.1	1 U	1	<u>12.2</u>	1
Dichlorodifluoromethane	μg/L	20	41	9.9	1 U	1	1 U	1
Ethylbenzene	μg/L	700	220	49	1 U	1	1 U	1
Tetrachloroethene	μg/L	5	340	21	1 U	1	1 U	1
Toluene	μg/L	1000	110000	26000	1 U	1	1 U	1
Trichlorofluoromethane	μg/L	520	NA	NA	3.64	1	26.5	1

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Table 1. Summary of Phase I Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

		Deep Interval Results INS-0385 INS-0387 INS-0388											
			INS-0385		INS-0387		INS-0387		INS-0388				
			0385-GW02-031513		0387-GW-051613		0387-GW-051613D		0388-GW-051713	1 1			
			37 - 42		35 - 45		35 - 45		33.5 - 43.5				
Analyte ^a	Units	MCL / RSL	3/15/2013	RL	5/16/2013	RL	5/16/2013	RL	5/17/2013	RL			
svoc													
1,4-Dioxane (p-Dioxane)	μg/L	0.46	11.6	10.5									
Isophorone	μg/L	78	5.26 U	5.26						1 1			
Naphthalene	μg/L	0.17	5.26 U	5.26									
voc													
1,1-Dichloroethane	μg/L	2.8	3.98	1	1 U	1	1 U	1	1 U	1			
1,1-Dichloroethene	μg/L	7	1 U	1	1 U	1	1 U	1	1 U	1			
1,2-Dichloroethane	μg/L	5	1 U	1	1 U	1	1 U	1	1 U	1			
Acetone	μg/L	1400	5 U	5	5 UL	5	5 UL	5	5 U	5			
Benzene	μg/L	5	1 U	1	1 U	1	1 U	1	1 U	1			
Chlorobenzene	μg/L	100	1 U	1	1 U	1	1 U	1	205	1			
Chloroform	μg/L	80	24.6	1	1 U	1	1 U	1	2.25	1			
Dichlorodifluoromethane	μg/L	20	2.09	1	1 UJ	1	1 UJ	1	1 U	1			
Ethylbenzene	μg/L	700	1 U	1	1 U	1	1 U	1	1 U	1			
Tetrachloroethene	μg/L	5	1 U	1	1 U	1	1 U	1	1 U	1			
Toluene	μg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1			
Trichlorofluoromethane	μg/L	520	52.1	1	1 U	1	1 U	1	3.11	1			

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Table 1. Summary of Phase I Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

		Deep Interval Results INS-0387 INS-0389 INS-0389										
			INS-0387		INS-0387		INS-0388		INS-0389			
			0387-GW02-031413		0387-GW02-031413D		0388-GW02-031413		0389-GW-051613			
			40 - 45		40 - 45		42 - 47		35-45			
Analyte ^a	Units	MCL / RSL	3/14/2013	RL	3/14/2013	RL	3/14/2013	RL	5/16/2013	RL		
svoc												
1,4-Dioxane (p-Dioxane)	μg/L	0.46	1.1 UJ	1.1	1.12 UJ	1.12	5.46 J	1.09				
Isophorone	μg/L	78	5.49 U	5.49	5.62 U	5.62	5.43 U	5.43				
Naphthalene	μg/L	0.17	5.49 U	5.49	5.62 U	5.62	5.43 U	5.43				
voc												
1,1-Dichloroethane	μg/L	2.8	1.26	1	1.24	1	1.76	1	6.18	1		
1,1-Dichloroethene	μg/L	7	1 U	1	1 U	1	1 U	1	1.03	1		
1,2-Dichloroethane	μg/L	5	1 U	1	1 U	1	1 U	1	1 U	1		
Acetone	μg/L	1400	5 UL	5	5 UL	5	5 U	5	5 U	5		
Benzene	μg/L	5	1 U	1	1 U	1	5.3	1	1 U	1		
Chlorobenzene	μg/L	100	1 U	1	1 U	1	1 U	1	1 U	1		
Chloroform	μg/L	80	1.78	1	1.56	1	29.9	1	29.6	1		
Dichlorodifluoromethane	μg/L	20	1 U	1	1 U	1	1 U	1	43 K	1		
Ethylbenzene	μg/L	700	1 U	1	1 U	1	1 U	1	1 U	1		
Tetrachloroethene	μg/L	5	1 U	1	1 U	1	1 U	1	1 U	1		
Toluene	μg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1		
Trichlorofluoromethane	μg/L	520	2.29	1	2.05	1	49.5	1	141	1		

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Table 1. Summary of Phase I Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

				eep Ir	nterval Results			
			INS-0389		INS-0390		INS-0390	
			0389-GW02-031313		0390-GW-051713		0390-GW02-031213	
			42 - 47		35 - 45		42 - 47	
Analyte ^a	Units	MCL / RSL	3/13/2013	RL	5/17/2013	RL	3/12/2013	RL
svoc								
1,4-Dioxane (p-Dioxane)	μg/L	0.46	4.83 J	1.08			36.7	10.3
Isophorone	μg/L	78	5.38 U	5.38			5.15 U	5.15
Naphthalene	μg/L	0.17	5.38 U	5.38			5.15 U	5.15
voc								
1,1-Dichloroethane	μg/L	2.8	12.3	1	2.96	1	1.51	1
1,1-Dichloroethene	μg/L	7	1.15	1	1.4	1	1 U	1
1,2-Dichloroethane	μg/L	5	1 U	1	1 U	1	1 U	1
Acetone	μg/L	1400	5 U	5	5 U	5	5 U	5
Benzene	μg/L	5	1 U	1	1.67	1	1 U	1
Chlorobenzene	μg/L	100	1 U	1	37.7	1	1 U	1
Chloroform	μg/L	80	13.8	1	13	1	1 U	1
Dichlorodifluoromethane	μg/L	20	57.2 L	1	1 U	1	1 UJ	1
Ethylbenzene	μg/L	700	1 U	1	1 U	1	1 U	1
Tetrachloroethene	μg/L	5	1 U	1	1 U	1	1 U	1
Toluene	μg/L	1000	1 U	1	1 U	1	1 U	1
Trichlorofluoromethane	μg/L	520	25.6 L	1	30.5	1	1 U	1

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and

1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

Underlined results indicate shallow concentrations detected above the Residential VISL (no concentrations are greater than commercial/industrial VISLs).

Grey shaded result indicates concentration detected above the MCL/RSL.

μg/L = micrograms per liter

NA = Not applicable

J flag indicates the reported concentration is estimated.

K flag indicates the reported concentration is biased high.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

U flag indicates the constituent was not detected above the reporting detection limit (RL).

UJ flag indicates the constituent was not detected above an estimated reporting detection limit.

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Table 2. Summary of Phase II Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

Onion Carbide Corporation, i		ionity, motitat	e, rreet ragaa	<u>u</u>	C	1 11						
		40.40			TO A SECRET CONTROL OF THE PARTY OF THE PART	nallow	Interval Results		INC 0467		INIC 0460	
				Location>>	INS-0465		INS-0466		INS-0467		INS-0468	1 1
				Sample ID>>	0465-GW01-102714		0466-GW01-102814		0467-GW01-102114		0468-GW01-102414	1 1
			•	Depth (ft)>>			22 - 26		32 - 36 10/21/2014		32 - 36 10/24/2014	1 1
			RBSLs	mple Date>>	10/27/2014		10/28/2014		10/21/2014		10/24/2014	1 1
			RBSLS	ı								1 1
												1 1
			Commercial/I									1 1
Analyte ^a	Units	MCL / RSL	ndustrial VISL	VISL		RL		RL		RL		RL
svoc												
1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	4.64	1.15	1.05 U	1.05	5.05	1.08	2,52	1.11
Isophorone	μg/L	78	NA	NA	5.75 U	5.75	5.26 U	5.26	5.38 UJ	5.38	2.78 U	5.56
Naphthalene	μg/L	0.17	310	7.2	5.75 U	5.75	5.26 U	5.26	5.38 UJ	5.38	2.78 U	5.56
voc												
1,1-Dichloroethane	μg/L	2.8	430	9.9	1 U	1	1 U	1	6.44	1	0.125 U	1
1,1-Dichloroethene	μg/L	7	1000	240	1 U	1	1 U	1	2.73	1	0.5 U	1
1,2-Dichloroethane	μg/L	5	130	30	1 U	1	1 U	1	1 U	1	0.25 U	1
Acetone	μg/L	1400	120000000	29000000	5 UJ	5	5 UJ	5	5 U	5	2.5 UJ	5
Benzene	μg/L	5	92	2.1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chlorobenzene	μg/L	100	2400	570	1 U	1	1 U	1	1 U	1	0.125 U	1
Chloroform	μg/L	80	46	1.1	1 U	1	1 U	1	1.07	1	0.125 U	1
Dichlorodifluoromethane	μg/L	20	41	9.9	1 UJ	1	1 UJ	1	1 UJ	1	0.25 UJ	1
Ethylbenzene	μg/L	700	220	49	1 U	1	1 U	1	1 U	1	0.25 U	1
Tetrachloroethene	μg/L	5	340	21	1 U	1	1 U	1	1 U	1	0.25 U	1
Toluene	μg/L	1000	110000	26000	1 U	1	1 U	1	1 U	1	0.25 U	1
Trichlorofluoromethane	μg/L	520	NA	NA	1 U	1	1 U	1	1 U	1	0.25 U	1

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Table 2. Summary of Phase II Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation. Institute Facility. Institute. West Virginia

, , , , , , , , , , , , , , , , , , ,		,				Deep	Interval Results					
		Location>> Sample ID>> Depth (ft)>>	0465-GW02-102714 44 - 47		INS-0466 0466-GW02-102814 42 - 46	***************************************	INS-0466 0466-GW02-102814D 42 - 46		INS-0467 0467-GW02-102114 42 - 46		INS-0468 0468-GW02-102414 41 - 45	
Analyte ^a	Units	mple Date>> MCL / RSL	10/27/2014	RL	10/27/2014	RL	10/28/2014	RL	10/21/2014	RL	10/24/2014	RL
svoc	Oilles	WICE / NOE		IVE		ILL		11.		ILL		
1,4-Dioxane (p-Dioxane)	μg/L	0.46	14.7	11.1	7.02	1.08	5.58	1.12	22.2 K	10.8	3.61	1.27
Isophorone	μg/L	78	5.56 U	5.56	5.38 U	5.38	5.62 U	5.62	5.38 UJ	5.38	3.16 UL	6.33
Naphthalene	μg/L	0.17	5.56 U	5.56	5.38 U	5.38	5.62 U	5.62	5.38 UJ	5.38	3.16 UL	6.33
voc												
1,1-Dichloroethane	μg/L	2.8	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
1,1-Dichloroethene	μg/L	7	1 U	1	1 U	1	1 U	1	1 U	1	0.5 U	1
1,2-Dichloroethane	μg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Acetone	μg/L	1400	5 UJ	5	5 UJ	5	5 UJ	5	5 U	5	2.5 UJ	5
Benzene	μg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chlorobenzene	μg/L	100	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Chloroform	μg/L	80	1 U	1	1 U	1	1 U	1	1 U	1	0.125 U	1
Dichlorodifluoromethane	μg/L	20	1 UJ	1	1 UJ	1	1 UJ	1	1 UJ	1	0.25 UJ	1
Ethylbenzene	μg/L	700	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Tetrachloroethene	μg/L	5	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Toluene	μg/L	1000	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1
Trichlorofluoromethane	μg/L	520	1 U	1	1 U	1	1 U	1	1 U	1	0.25 U	1

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

No shallow interval concentrations are greater than the residential or commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

μg/L = micrograms per liter

NA = Not applicable

U flag indicates the constituent was not detected above the reporting detection limit (RL).

UJ flag indicates the constituent was not detected above an estimated reporting detection limit.

K flag indicates the reported concentration is biased high.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

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Table 3. Summary of Phase III Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Inter	val Results					
										1	
1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000		4.2	0.5	5.13	1.06	5.41	1.06
svoc											
Analyte ^a	Units	MCL / RSL	Commercial /Industrial VISL	Residential VISL	Depth (ft)>> Sample Date>>	18 - 22 2/11/2015	RL	34 - 38 2/12/2015	RL	34 ⁻ 38 2/12/2015	RL
			RBSLs		Sample ID>>	0470-GW01-021115S		0471-GW01-021215		0471-GW01-021215D	
					Location>>	Shallow Interval Resu	ılts	INS-0471		INS-0471	
SVOC 1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	C000000	3.46	1.19	2.3	0.11	5.19	1.33
Analyte ^a	Units	MCL / RSL	VISL	VISL			RL		RL		RL
			•	Residential	Sample ID>> Depth (ft)>> Sample Date>>	0469-GW01-021015 33 - 37 2/10/2015		0469-GW01-021015S 33 - 37 2/10/2015		0470-GW01-021115 18 - 22 2/11/2015	
					Location>>	INS-0469		INS-0469		INS-0470	
			and the same of			Shallow Interval Resi	ults				and any any

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Table 3. Summary of Phase III Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Ir	nterval Results			
Deep Interval Results	Location>> Sample ID>>			INS-0470 0470-GW02-021115S		INS-0471 0471-GW02-021215S	
	Depth (ft)>>	46 - 50		46 - 50		44 - 48	
Analyte ^a	Sample Date>> Units MCL / RSL	2/11/2015	RL	2/11/2015	RL	2/12/2015	RL
svoc							
1,4-Dioxane (p-Dioxane)	μg/L 0.46	3.48	1.08	2.3	0.11	3.3	0.11

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06

for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the residential or commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

 μ g/L = micrograms per liter

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Table 4. Summary of Phase IV Groundwater Data

					Shallow Inte	erval Res	ults			
				Location>>	MW-104		TW-102		TW-103	
				Sample ID>>	MW104-GW-071115		TW102-GW01-070915		TW103-GW01-070815	
				Depth (ft)>>	23-33		8.5-12.5		18-22	
			Sa	ımple Date>>	7/11/2015		7/9/2015		7/8/2015	
			RBSLs							
			Commercial							
_			/Industrial	Residential						
Analyte ^a	Units	MCL / RSL	VISL	VISL		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	0.85	0.21	0.59 L	0.21	0.21 U	0.21
Isophorone	μg/L	78	NA	NA	1 U	1	1 U	1	1 U	1
Naphthalene	μg/L	0.17	310	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
voc										
1,1-Dichloroethane	μg/L	2.8	430	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7	1000	240	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	5	130	30	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400	120000000	29000000	5 U	5	5 U	5	6	5
Benzene	μg/L	5	92	2.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100	2400	570	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	46	1.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	μg/L	20	41	9.9	0.5 U	0.5	0.5 U	0.5	0.5 ป	0.5
Ethylbenzene	μg/L	700	220	49	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	340	21	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	μg/L	1000	110000	26000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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Table 4. Summary of Phase IV Groundwater Data

		Shallow Interval Results										
				Location>>	TW-104		TW-105		TW-106			
				Sample ID>>	TW104-GW01-062515		TW105-GW01-062515		TW106-GW01-062515			
				Depth (ft)>>	16-20		17-21		17-21			
			Sa	mple Date>>	6/25/2015		6/25/2015		6/25/2015			
			RBSLs									
Analyte ^a	Units	MCL / RSL	Commercial /Industrial VISL	Residential VISL		RL		RL		RL		
svoc												
1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	0.22 U	0.22	0.21 U	0.21	0.23 U	0.23		
Isophorone	μg/L	78	NA	NA	1 U	1	1 U	1	1 U	1		
Naphthalene	μg/L	0.17	310	7.2	0.5 U	0.5	0.5 U	0.5	0.6 U	0.6		
voc												
1,1-Dichloroethane	μg/L	2.8	430	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
1,1-Dichloroethene	μg/L	7	1000	240	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
1,2-Dichloroethane	μg/L	5	130	30	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Acetone	μg/L	1400	120000000	29000000	5 U	5	5 U	5	5 U	5		
Benzene	μg/L	5	92	2.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Chlorobenzene	μg/L	100	2400	570	12	0.5	0.5 U	0.5	0.5 U	0.5		
Chloroform	μg/L	80	46	1.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Dichlorodifluoromethane	μg/L	20	41	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Ethylbenzene	μg/L	700	220	49	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Tetrachloroethene	μg/L	5	340	21	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Toluene	μg/L	1000	110000	26000	0.5 U	0.5	0.5 ป	0.5	0.5 ป	0.5		
Trichlorofluoromethane	μg/L	520	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		

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Table 4. Summary of Phase IV Groundwater Data

					Shallow Into	erval Res	sults			
				Location>>	TW-107		TW-108		TW-108	
				Sample ID>>	TW107-GW01-070715		TW108-GW01-070815		TW108-GW01-070815D	
				Depth (ft)>>	17-21		17-21		17-21	
			Sa	mple Date>>	7/7/2015		7/8/2015		7/8/2015	
			RBSLs							
			Commercial /Industrial	Residential						
Analyte ^a	Units	MCL / RSL	VISL	VISL		RL		RL		RL
svoc										
1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	2.2 L	0.29	3.5	0.2	4.1	0.2
Isophorone	μg/L	78	NA	NA	1 U	1	1 UL	1	1 U	1
Naphthalene	μg/L	0.17	310	7.2	7	0.7	0.5 UL	0.5	0.5 U	0.5
voc										
1,1-Dichloroethane	μg/L	2.8	430	9.9	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7	1000	240	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	5	130	30	4.7	2.5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400	120000000	29000000	25 U	5	5 U	5	5 U	5
Benzene	μg/L	5	92	2.1	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100	2400	570	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	46	1.1	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	μg/L	20	41	9.9	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	μg/L	700	220	49	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	340	21	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Toluene	μg/L	1000	110000	26000	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	NA	NA	2.5 U	2.5	0.5 U	0.5	0.5 U	0.5

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Table 4. Summary of Phase IV Groundwater Data

					Deep Interval Res	ults				
		Location>>	TW-102		TW-103		TW-103		TW-104	
		Sample ID>>	TW102-GW02-070915		TW103-GW02-070815		TW103-GW-080115		TW104-GW02-062515	1 1
		Depth (ft)>>	38-42		48-52		47-57		46-56	1 1
	s	ample Date>>	7/9/2015		7/8/2015		8/1/2015		6/25/2015	1 1
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL
svoc										
1,4-Dioxane (p-Dioxane)	μg/L	0.46	0.2 U	0.2	0.2 U	0.2	0.2 U	0.2	8.5	0.2
Isophorone	μg/L	78	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	μg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
voc										
1,1-Dichloroethane	μg/L	2.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400	9.2	5	5 U	5	5 U	5	5 U	5
Benzene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	μg/L	20	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	22	0.5
Ethylbenzene	μg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	μg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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Table 4. Summary of Phase IV Groundwater Data

					Deep Interval R	esults				
		Location>>	TW-104		TW-105		TW-106		TW-107	
		Sample ID>>	TW104-GW-080115		TW105-GW-073115		TW106-GW-080115		TW107-GW-073015	1 1
		Depth (ft)>>	45-55		48-58		48-58		42-52	1 1
	Sai	mple Date>>	8/1/2015		7/31/2015		8/1/2015		7/30/2015	1 1
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL
svoc										
1,4-Dioxane (p-Dioxane)	μg/L	0.46	3.7	0.2	0.2 U	0.2	2	0.2	0.3	0.2
Isophorone	μg/L	78	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	μg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	13	0.5
voc										
1,1-Dichloroethane	μg/L	2.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400	5 U	5	5 U	5	5 U	5	5 U	5
Benzene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	0.5 U	0.5	3.1	0.5	0.5 U	0.5	0.7	0.5
Dichlorodifluoromethane	μg/L	20	1	0.5	0.5 U	0.5	17	0.5	0.5 U	0.5
Ethylbenzene	μg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	μg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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Table 4. Summary of Phase IV Groundwater Data

					Deep Interval Re	esults				
		Location>>	TW-108		TW-109		TW-110		TW-111	
		Sample ID>>	TW108-GW-073115		TW109-GW-073115		TW110-GW-073115		TW111-GW-080115	1
		Depth (ft)>>	45-55		48-58		44-54		41.5-51.5	1
	Sa	mple Date>>	7/31/2015		7/31/2015		7/31/2015		8/1/2015	1 1
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL
svoc										
1,4-Dioxane (p-Dioxane)	μg/L	0.46	19	1.1	8	0.21	19	1.1	32	2
Isophorone	μg/L	78	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	μg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
voc										
1,1-Dichloroethane	μg/L	2.8	0.5 U	0.5	0.6	0.5	6.9	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7	0.5 U	0.5	0.5 U	0.5	5 L	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 UL	0.5	0.5 U	0.5
Acetone	μg/L	1400	44	5	39	5	5 U	5	5 U	5
Benzene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 UL	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	0.5 U	0.5	2.6	0.5	1.1 L	0.5	0.5 U	0.5
Dichlorodifluoromethane	μg/L	20	0.5 U	0.5	1.4	0.5	0.6	0.5	0.5 U	0.5
Ethylbenzene	μg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	μg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	0.5 U	0.5	0.5 U	0.5	2	0.5	0.5 U	0.5

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Table 4. Summary of Phase IV Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

			Deep Interval Re	esults		
		Location>>	TW-112		TW-113	
		Sample ID>>	TW112-GW-073115		TW113-GW-073015	
		Depth (ft)>>	35-45		41-51	
	Sa	mple Date>>	7/31/2015		7/30/2015	
Analyte ^a	Units	MCL / RSL		RL		RL
svoc						
1,4-Dioxane (p-Dioxane)	μg/L	0.46	3	0.2	3	0.2
Isophorone	μg/L	78	1 U	1	1 U	1
Naphthalene	μg/L	0.17	0.5 U	0.5	0.5 U	0.5
voc						
1,1-Dichloroethane	μg/L	2.8	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400	5 U	5	5 U	5
Benzene	μg/L	5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	0.5	0.5	0.5 U	0.5
Dichlorodifluoromethane	μg/L	20	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	μg/L	700	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	0.5 U	0.5	0.5 U	0.5
Toluene	μg/L	1000	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	0.5 U	0.5	0.5 U	0.5

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results only.

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the residential or commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

μg/L = micrograms per liter

NA = Not applicable

L flag indicates the reported concentration is biased low.

U flag indicates the constituent was not detected above the reporting detection limit.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

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Table 5. Summary of Phase V Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

•							Shallow Interval	Resu	lts					
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
			Sa	mple Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
			RBSLs											
Analyte ^a	Units	MCL / RSL	Commercial /Industrial VISL	Residential VISL		RL		RL		RL		RL		RL
svoc														П
1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	0.20 U	0.21	0.49	0.2	7.7	0.2	3.4	0.2	0.20 U	0.2
Isophorone	μg/L	78	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Naphthalene	μg/L	0.17	310	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
voc														
1,1-Dichloroethane	μg/L	2.8	430	9.9	0.5 U	0.5	0.5 U	0.5	0.5 ป	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7	1000	240	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 ป	0.5
1,2-Dichloroethane	μg/L	5	130	30	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400	120000000	29000000	5 U	5	5 U	5	5 U	5	5 U	5	0.5 ป	5
Benzene	μg/L	5	92	2.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100	2400	570	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	46	1.1	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	μg/L	20	41	9.9	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	μg/L	700	220	49	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	340	21	<u>30</u>	0.5	0.5 U	0.5	0.5 U	0.5	0.5 ป	0.5	0.5 U	0.5
Toluene	μg/L	1000	110000	26000	0.5 ป	0.5	0.5 ป	0.5	0.5 U	0.5	0.5 ป	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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Table 5. Summary of Phase V Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

Onion Carbide Corporation,	IIISHILILE I	acility, ilis	itute, vvest virgitila							
					Deep Interval	Result	·S			
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
	s	ample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
	1	Depth (ft)>>	51-55		51-55		47-51		47-51	
	San	ple Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL
SVOC										
1,4-Dioxane (p-Dioxane)	μg/L	0.46	0.24	0.21	0.22 U	0.21	0.48	0.21	0.47	0.21
Isophorone	μg/L	78	1 U	1	1 U	1	R	1	R	1
Naphthalene	μg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
voc										
1,1-Dichloroethane	μg/L	2.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400	5 U	5	22	5	5 U	5	5 U	5
Benzene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	μg/L	20	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	μg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	μg/L	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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Table 5. Summary of Phase V Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

<u> </u>		Deep Interval Results TW/105 TW/105												
	S	Location>> Sample ID>>			INS-0574 0574-GW01-012116		TW-105 TW105-GW-011416		TW-105 TW105-GW-011416D		TW-106 TW106-GW-011416			
		Depth (ft)>> nple Date>>	46-50		47-51 1/21/2016		48-58 1/14/2016		48-58 1/14/2016		48-58 1/14/2016			
Analyte ^a	Units	MCL / RSL		RL	_,,	RL	_,,	RL	_,,	RL	-,,	RL		
SVOC														
1,4-Dioxane (p-Dioxane)	μg/L	0.46	0.57		2,5		0.21 U	0.21	0.2 U	0.2	1.7	0.2		
Isophorone	μg/L	78	1 U		1 U		1 U	1	1 U	1	1 U	1		
Naphthalene	μg/L	0.17	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
voc														
1,1-Dichloroethane	μg/L	2.8	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
1,1-Dichloroethene	μg/L	7	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
1,2-Dichloroethane	μg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Acetone	μg/L	1400	5.0 U		5.0 U		5 U	5	5 U	5	5 U	5		
Benzene	μg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Chlorobenzene	μg/L	100	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Chloroform	μg/L	80	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Dichlorodifluoromethane	μg/L	20	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	17 J	0.5		
Ethylbenzene	μg/L	700	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Tetrachloroethene	μg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		
Toluene	μg/L	1000	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 ป	0.5		
Trichlorofluoromethane	μg/L	520	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5		

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on

a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and

1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

<u>Underlined results indicate shallow concentrations detected above the Residential VISL.</u>

μg/L = micrograms per liter

NA = Not applicable

R flag indicates the data were not of sufficient quality for reporting.

U flag indicates the constituent was not detected above the reporting detection limit.

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Table 6. Summary of Additional Analyses - Phase V

Official Carbiae Corporation, ins		- //	,		SI	hallow	Interval Results							
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
			Sa	mple Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
			RBSLs											
			Commercial/											
			Industrial .	Residential									İ	
Analyte ^a	Units	MCL / RSL	VISL	VISL		RL		RL		RL		RL		RL
voc														
1,1,2,2-Tetrachloroethane	μg/L	0.076	200	4.6	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	μg/L	5	36	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	μg/L	15	180	43	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	μg/L	5	140	3.3	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	μg/L	120	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	μg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	μg/L	75	170	3.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	μg/L	5600	13000000	3000000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2-Hexanone	μg/L	38	49000	12000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	μg/L	6300	3300000	780000	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	μg/L	80	51	1.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	μg/L	7.5	89	21	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	μg/L	810	6600	1600	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	μg/L	5	24	0.54	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	μg/L	190	1300	310	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	μg/L	70	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	μg/L	80	18	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	μg/L	5	25000	970	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	μg/L	100	56000	13000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	μg/L	100	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	μg/L	5	29	1.6	2.3	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	μg/L	2	29	0.24	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	μg/L	10000	2300	550	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
svoc														
2,4,5-Trichlorophenol	μg/L	1200	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4,6-Trichlorophenol	μg/L	4.1	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dichlorophenol	μg/L	46	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dimethylphenol	μg/L	360	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2,4-Dinitrophenol	μg/L	39	NA	NA	31 UJ	31	30 U	30	30 U	30	R	30	30 U	30
2,4-Dinitrotoluene	μg/L	0.24	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2,6-Dinitrotoluene	μg/L	0.049	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Chloronaphthalene	μg/L	750	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Chlorophenol	μg/L	91	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2-Methylnaphthalene	μg/L	36	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.051	0.052 U	0.052

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Table 6. Summary of Additional Analyses - Phase V

Onion Carbide Corporation, ins		- //		,	S	hallow	Interval Results							
	320000000000000000000000000000000000000			Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	200000000000000000000000000000000000000
	1			Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
	1			Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
	1		Sa	mple Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
	1		RBSLs											
			Commercial/											
	1		Industrial	Residential										
Analyte ^a	Units	MCL / RSL	VISL	VISL		RL		RL		RL		RL		RL
SVOC (continued)														
2-Methylphenol	μg/L	930	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
2-Nitroaniline	μg/L	190	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
2-Nitrophenol	μg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
3,3'-Dichlorobenzidine	μg/L	0.13	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
3-Nitroaniline	μg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4,6-Dinitro-2-methylphenol	μg/L	1.5	NA	NA	15 UJ	15	15 U	15	15 U	15	R	15	15 U	15
4-Bromophenyl phenyl ether	μg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Chloro-3-methylphenol	μg/L	1400	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
4-Chloroaniline	μg/L	0.37	NA	NA	4 U	4	4 U	4	4 U	4	4 U	4	4 U	4
4-Chlorophenyl phenyl ether	μg/L	NA	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Nitroaniline	μg/L	3.8	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
4-Nitrophenol	μg/L	42	0.0000011	NA	31 U	31	30 U	30	30 U	30	R	30	30 U	30
Acenaphthene	μg/L	530	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acenaphthylene	μg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Anthracene	μg/L	1800	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Benzo (a) anthracene	μg/L	0.012	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.052	0.052 U	0.052
Benzo (a) pyrene	μg/L	0.2	NA	NA	0.5 U	0.5	0.052 U	0.5	0.052 U	0.5	0.051 U	0.5	0.052 U	0.5
Benzo (b) fluoranthene	μg/L	0.034	NA	NA	0.5 U	0.5	0.052 U	0.5	0.052 U	0.5	0.051 U	0.5	0.052 U	0.5
Benzo (g,h,i) perylene	μg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Benzo(k)fluoranthene	μg/L	0.34	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bis (2-chloroethoxy) methane	μg/L	59	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Bis (2-chloroethyl) ether	μg/L	0.014	850	20	0.052 U	0.052	0.051 U	0.051	0.051 U	0.051	0.05 U	0.051	0.051 UJ	0.051
Bis (2-chloroisopropyl) ether	μg/L	710	610	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Bis (2-ethylhexyl) phthalate	μg/L	6	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Butyl benzylphthalate	μg/L	16	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Chrysene	μg/L	3.4	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Di-n-butylphthalate	μg/L	900	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Di-n-octylphthalate	μg/L	200	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Dibenzo (a,h) anthracene	μg/L	0.0034	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibenzofuran	μg/L	7.9	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Diethyl phthalate	μg/L	15000	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Dimethyl phthalate	μg/L	NA	NA	NA	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Ethyl ether	μg/L	3900	NA	NA	0.5 U	0.5	3 K	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	μg/L	800	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V Union Carbide Corporation, Institute Facility, Institute, West Virginia

		,			SI	nallow	Interval Results							
				Location>>	INS-0555		INS-0559		INS-0563		INS-0566		INS-0570	
				Sample ID>>	0555-GW01-012116		0559-GW01-011916		0563-GW01-011916		0566-GW01-011916		0570-GW01-011916	
				Depth (ft)>>	22-26		21-25		22-26		18-22		18-22	
			Sa	mple Date>>	1/21/2016		1/19/2016		1/19/2016		1/19/2016		1/19/2016	
			RBSLs											
			Commercial/											
			Industrial	Residential										
Analyte ^a	Units	MCL / RSL	VISL	VISL		RL		RL		RL		RL		RL
SVOC (continued)														
Fluorene	μg/L	290	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Hexachlorobenzene	μg/L	1	0.65	0.15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Hexachlorobutadiene	μg/L	0.14	21	0.47	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Hexachlorocyclopentadiene	μg/L	50	5.2	1.2	15 U	15	15 U	15	15 U	15	15 U	15	15 U	15
Hexachloroethane	μg/L	0.33	110	2.6	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Indeno (1,2,3-c,d) pyrene	μg/L	0.034	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
n-Nitrosodi-n-propylamine	μg/L	0.011	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
n-Nitrosodiphenylamine	μg/L	12	NA	NA	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Nitrobenzene	μg/L	0.14	5000	110	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
p-Cresol	μg/L	1900	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
Pentachlorophenol	μg/L	1	NA	NA	5 U	5	5 U	5	5 U	5	R	5	5 U	5
Phenanthrene	μg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Phenol	μg/L	5800	NA	NA	1 U	1	1 U	1	1 U	1	R	1	1 U	1
Pyrene	μg/L	120	NA	NA	0.5 U	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.051	0.052 U	0.052
Metal														
Arsenic, dissolved	mg/L	0.01	NA	NA			0.0643	0.02	0.131	0.02	0.02 U	0.02	0.02 U	0.02
Barium, dissolved	mg/L	2	NA	NA			0.562	0.005	0.668	0.005	1.58	0.005	0.0901	0.005
Cadmium, dissolved	mg/L	0.005	NA	NA			0.005 U	0.005						
Chromium, dissolved	mg/L	0.1	NA	NA			0.015 U	0.015						
Lead, dissolved	mg/L	0.015	NA	NA			0.015 U	0.015						
Mercury, dissolved	mg/L	0.002	0.0061	0.0015			0.0002 U	2E-04						
Selenium, dissolved	mg/L	0.05	NA	NA			0.02 U	0.02						
Silver, dissolved	mg/L	0.094	NA	NA			0.005 U	0.005						

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Table 6. Summary of Additional Analyses - Phase V

onion curbide corporation, ins		**	, 3		Deep Interval R	esults				
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
		Sample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
		Depth (ft)>>	51-55		51-55		47-51		47-51	
	Sa	ımple Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL
voc										
1,1,2,2-Tetrachloroethane	μg/L	0.076	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	μg/L	15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	μg/L	120	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	μg/L	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	μg/L	75	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	μg/L	5600	5 U	5	5.5	5	5 U	5	5 U	5
2-Hexanone	μg/L	38	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	μg/L	6300	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	μg/L	7.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	μg/L	810	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	μg/L	190	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	μg/L	70	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	μg/L	2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	μg/L	10000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
svoc										
2,4,5-Trichlorophenol	μg/L	1200					1 U	1	1 U	1
2,4,6-Trichlorophenol	μg/L	4.1					1 U	1	1 U	1
2,4-Dichlorophenol	μg/L	46					1 U	1	1 U	1
2,4-Dimethylphenol	μg/L	360					1 U	1	1 U	1
2,4-Dinitrophenol	μg/L	39					31 U	31	31 U	31
2,4-Dinitrotoluene	μg/L	0.24					R	5	R	5
2,6-Dinitrotoluene	μg/L	0.049					R	1	R	1
2-Chloronaphthalene	μg/L	750					R	1	R	1
2-Chlorophenol	μg/L	91					1 U	1	1 U	1
2-Methylnaphthalene	μg/L	36					R	0.5	R	0.5

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Table 6. Summary of Additional Analyses - Phase V

	Location>>				Deep Interval R	esults				
	Sa	Location>> Sample ID>> Depth (ft)>> Imple Date>>	INS-0553 0553-GW02-011816 51-55 1/18/2016		INS-0554 0554-GW02-011816 51-55 1/18/2016		INS-0555 0555-GW02-012116 47-51 1/21/2016		INS-0555 0555-GW02-012116D 47-51 1/21/2016	
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL
SVOC (continued)										
2-Methylphenol	μg/L	930					1 U	1	1 U	1
2-Nitroaniline	μg/L	190					R	1	R	1
2-Nitrophenol	μg/L	NA					1 U	1	1 U	1
3,3'-Dichlorobenzidine	μg/L	0.13					R	5	R	5
3-Nitroaniline	μg/L	NA					R	1	R	1
4,6-Dinitro-2-methylphenol	μg/L	1.5					16 U	16	15 U	15
4-Bromophenyl phenyl ether	μg/L	NA					R	1	R	1
4-Chloro-3-methylphenol	μg/L	1400					1 U	1	1 U	1
4-Chloroaniline	μg/L	0.37					R	4	R	4
4-Chlorophenyl phenyl ether	μg/L	NA					R	1	R	1
4-Nitroaniline	μg/L	3.8					R	1	R	1
4-Nitrophenol	μg/L	42					31 U	31	31 U	31
Acenaphthene	μg/L	530					R	0.5	R	0.5
Acenaphthylene	μg/L	NA					R	0.5	R	0.5
Anthracene	μg/L	1800					R	0.5	R	0.5
Benzo (a) anthracene	μg/L	0.012					R	0.5	R	0.5
Benzo (a) pyrene	μg/L	0.2					R	0.5	R	0.5
Benzo (b) fluoranthene	μg/L	0.034					R	0.5	R	0.5
Benzo (g,h,i) perylene	μg/L	NA					R	0.5	R	0.5
Benzo(k)fluoranthene	μg/L	0.34					R	0.5	R	0.5
Bis (2-chloroethoxy) methane	μg/L	59					R	1	R	1
Bis (2-chloroethyl) ether	μg/L	0.014					0.052 U	0.05	0.051 U	0.05
Bis (2-chloroisopropyl) ether	μg/L	710					R	1	R	1
Bis (2-ethylhexyl) phthalate	μg/L	6					R	5	R	5
Butyl benzylphthalate	μg/L	16					R	5	R	5
Chrysene	μg/L	3.4					R	0.5	R	0.5
Di-n-butylphthalate	μg/L	900					R	5	R	5
Di-n-octylphthalate	μg/L	200					R	5	R	5
Dibenzo (a,h) anthracene	μg/L	0.0034					R	0.5	R	0.5
Dibenzofuran	μg/L	7.9					R	1	R	1
Diethyl phthalate	μg/L	15000					R	5	R	5
Dimethyl phthalate	μg/L	NA					R	5	R	5
Ethyl ether	μg/L	3900	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	μg/L	800					R	0.5	R	0.5

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Deep Interval R	esults				
		Location>>	INS-0553		INS-0554		INS-0555		INS-0555	
		Sample ID>>	0553-GW02-011816		0554-GW02-011816		0555-GW02-012116		0555-GW02-012116D	
		Depth (ft)>>	51-55		51-55		47-51		47-51	
	Sa	ample Date>>	1/18/2016		1/18/2016		1/21/2016		1/21/2016	
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL
SVOC (continued)		•								
Fluorene	μg/L	290					R	0.5	R	0.5
Hexachlorobenzene	μg/L	1					R	0.5	R	0.5
Hexachlorobutadiene	μg/L	0.14					R	1	R	1
Hexachlorocyclopentadiene	μg/L	50					R	16	R	15
Hexachloroethane	μg/L	0.33					R	5	R	5
Indeno (1,2,3-c,d) pyrene	μg/L	0.034					R	0.5	R	0.5
n-Nitrosodi-n-propylamine	μg/L	0.011					R	1	R	1
n-Nitrosodiphenylamine	μg/L	12					R	1	R	1
Nitrobenzene	μg/L	0.14					R	1	R	1
p-Cresol	μg/L	1900					1 U	1	1 U	1
Pentachlorophenol	μg/L	1					5 U	5	5 U	5
Phenanthrene	μg/L	NA		l			R	0.5	R	0.5
Phenol	μg/L	5800					1 U	1	1 U	1
Pyrene	μg/L	120		l			R	0.5	R	0.5

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Table 6. Summary of Additional Analyses - Phase V

Official Carbide Corporation, ins		//	-, <u>g</u>		20,000	Deep I	nterval Results					
		Location>>	INS-0573		INS-0574		TW-105		TW-105		TW-106	
		ample ID>>	0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	i l
		epth (ft)>>	46-50		47-51		48-58		48-58		48-58	i l
		ple Date>>	1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	i I
	J	pic buters	1, 21, 2010		1, 21, 2010		1,11,2010		1,11,2010		1,11,2010	i I
												i I
												i I
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL		RL
voc	1	·										$\overline{}$
1,1,2,2-Tetrachloroethane	μg/L	0.076	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	μg/L	15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	μg/L	120	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3-Dichlorobenzene	μg/L	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	μg/L	75	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	μg/L	5600	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
2-Hexanone	μg/L	38	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
4-Methyl-2-pentanone	μg/L	6300	5 U	5	5 U	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	μg/L	7.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	μg/L	810	1 U	1	1 U	1	1 U	1	1 U	1	1 U	1
Carbon tetrachloride	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	μg/L	190	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	μg/L	70	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	μg/L	2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	μg/L	10000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
svoc		_										
2,4,5-Trichlorophenol	μg/L	1200			1 U	1						i I
2,4,6-Trichlorophenol	μg/L	4.1			1 U	1						i I
2,4-Dichlorophenol	μg/L	46			1 U	1						i
2,4-Dimethylphenol	μg/L	360			1 U	1						i I
2,4-Dinitrophenol	μg/L	39			30 UJ	30						l I
2,4-Dinitrotoluene	μg/L	0.24			5 U	5						
2,6-Dinitrotoluene	μg/L	0.049			1 U	1						
2-Chloronaphthalene	μg/L	750			1 U	1						
2-Chlorophenol	μg/L	91			1 U	1						1
2-Methylnaphthalene	μg/L	36			0.5 U	0.5						

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V Union Carbide Corporation, Institute Facility, Institute, West Virginia

Onion Carbide Corporation, ins		-//	,		E-1	Deep l	nterval Results					
		Location>>	INS-0573		INS-0574	•	TW-105		TW-105		TW-106	
	1	ample ID>>	0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
		Depth (ft)>>	46-50		47-51		48-58		48-58		48-58	
		ple Date>>	1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
		•	, ,		, ,		' '		, ,		, ,	
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL		RL
SVOC (continued)		•										
2-Methylphenol	μg/L	930			1 U	1						
2-Nitroaniline	μg/L	190			1 U	1						
2-Nitrophenol	μg/L	NA			1 U	1						
3,3'-Dichlorobenzidine	μg/L	0.13			5 U	5						
3-Nitroaniline	μg/L	NA			1 U	1						
4,6-Dinitro-2-methylphenol	μg/L	1.5			15 U	15						
4-Bromophenyl phenyl ether	μg/L	NA			1 U	1						
4-Chloro-3-methylphenol	μg/L	1400			1 U	1						
4-Chloroaniline	μg/L	0.37			4 U	4						
4-Chlorophenyl phenyl ether	μg/L	NA			1 U	1						
4-Nitroaniline	μg/L	3.8			1 U	1						
4-Nitrophenol	μg/L	42			30 U	30						
Acenaphthene	μg/L	530			0.5 U	0.5						
Acenaphthylene	μg/L	NA			0.5 U	0.5						
Anthracene	μg/L	1800			0.5 U	0.5						
Benzo (a) anthracene	μg/L	0.012			0.5 U	0.5						
Benzo (a) pyrene	μg/L	0.2			0.5 U	0.5						
Benzo (b) fluoranthene	μg/L	0.034			0.5 U	0.5						
Benzo (g,h,i) perylene	μg/L	NA			0.5 U	0.5						
Benzo(k)fluoranthene	μg/L	0.34			0.5 U	0.5						
Bis (2-chloroethoxy) methane	μg/L	59			1 U	1						
Bis (2-chloroethyl) ether	μg/L	0.014			0.051 U	0.051						
Bis (2-chloroisopropyl) ether	μg/L	710			1 U	1						
Bis (2-ethylhexyl) phthalate	μg/L	6			5 U	5						
Butyl benzylphthalate	μg/L	16			5 U	5						
Chrysene	μg/L	3.4			0.5 U	0.5						
Di-n-butylphthalate	μg/L	900			5 U	5						
Di-n-octylphthalate	μg/L	200			5 U	5						
Dibenzo (a,h) anthracene	μg/L	0.0034			0.5 U	0.5						
Dibenzofuran	μg/L	7.9			1 U	1						
Diethyl phthalate	μg/L	15000			5 U	5						
Dimethyl phthalate	μg/L	NA			5 U	5						
Ethyl ether	μg/L	3900	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	μg/L	800			0.5 U	0.5						

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Table 6. Summary of Additional Analyses - Phase V

ornori carbiae corporation, ma			-		-1	Deep li	nterval Results					
	S E	Location>> ample ID>> Depth (ft)>> uple Date>>	0573-GW01-012116 46-50		INS-0574 0574-GW01-012116 47-51 1/21/2016		TW-105 TW105-GW-011416 48-58 1/14/2016		TW-105 TW105-GW-011416D 48-58 1/14/2016		TW-106 TW106-GW-011416 48-58 1/14/2016	
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL		RL
SVOC (continued)		•										
Fluorene	μg/L	290			0.5 U	0.5						
Hexachlorobenzene	μg/L	1			0.5 U	0.5						
Hexachlorobutadiene	μg/L	0.14			1 U	1						
Hexachlorocyclopentadiene	μg/L	50			15 U	15						
Hexachloroethane	μg/L	0.33			5 U	5						
Indeno (1,2,3-c,d) pyrene	μg/L	0.034			0.5 U	0.5						
n-Nitrosodi-n-propylamine	μg/L	0.011			1 U	1						
n-Nitrosodiphenylamine	μg/L	12			1 U	1						
Nitrobenzene	μg/L	0.14			1 U	1						
p-Cresol	μg/L	1900			1 U	1						
Pentachlorophenol	μg/L	1			5 U	5						
Phenanthrene	μg/L	NA			0.5 U	0.5						
Phenol	μg/L	5800			1 U	1						
Pyrene	μg/L	120			0.5 U	0.5						

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06

for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

Italicized results indicate concentration detected above the Residential VISL.

mg/L = milligrams per liter

μg/L = micrograms per liter

NA = Not applicable

U flag indicates the constituent was not detected above the reporting detection limit.

UJ flag indicates the analyte was below the reported sample quantitation limit. However, the reported value is approximate.

K flag indicates the analyte was positively identified, but the associated numerical value may be biased high.

R flag indicates the sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet the quality control criteria. The presence or absence of the analyte cannot be verified.

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Original Copies of CH2M Hill and EnviroProbe Analytical Vapor Intrusion Investigation Data

Table 2-1. Athletic Facility Area Sampling Results
Eastern Property Boundary Vapor Intrusion Investigatior
UCC Institute Facility, Institute, West Virginia

	Location	INST-AF-AA01	INST-AF-IA01	INST-AF-IA02	INST-AF-IA03	INST-AF-IA04	INST-AF-IA05	INST-	AF-IA06	INST-AF-IA07	INST-AF-IA08	INST-AF-IA09	INST-AF-IA10
	Sample ID	AF-AA1-062015	AF-IA1-062015	AF-IA2-062015	AF-IA3-062015	AF-IA4-062015	AF-IA5-062015	AF-IA6-06202015	AF-IA6-06202015D	AF-IA7-062015	AF-IA8-062015	AF-IA9-062015	AF-IA10-062015
	Sample Date	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015
	Screening												
Analyte	Level ^a												
VOCs (μg/m³)													
1,1-Dichloroethane	77	0.148 U	0.148 U	0.146 U	0.151 U	0.146 U	0.152 U	0.155 U	0.148 U	0.143 U	0.139 U	0.149 U	0.143 U
1,1-Dichloroethene	880	0.145 U	0.145 U	0.143 U	0.148 U	0.143 U	0.149 U	0.152 U	0.145 U	0.14 U	0.136 U	0.146 U	0.14 U
1,4-Dioxane (p-Dioxane)	25	3.3 U	3.3 U	3.24 U	3.35 U	3.24 U	3.39 U	3.45 U	3.3 U	3.19 U	3.1 U	3.32 U	3.19 U
Benzene	16	0.585 U	0.585 U	0.575 U	0.595 U	0.575 U	0.601 U	0.611 U	0.585 U	0.566 U	0.549 U	0.588 U	0.566 U
Chlorobenzene	220	0.169 U	0.496	0.501	0.171 U	0.166 U	0.173 U	0.176 U	0.169 U	0.163 U	0.158 U	0.17 U	0.163 U
Chloroform	5.3	0.179 U	0.179 U	0.176 U	0.182 U	0.184	0.22 B	0.195 B	0.191 B	0.173 U	0.168 U	0.18 U	0.173 U
Trichlorofluoromethane		1.18	0.852	0.863	0.903	0.909	1.09	1.5	1.39	1.33	1.22	1.23	1.2
VOCs, Total		1.18	1.348	1.364	0.903	1.093	1.31	1.695	1.581	1.33	1.22	1.23	1.2

Notes

a : Screening levels are based on USEPA regional screening levels (RSLs; USEPA 2015b) for indoor air for a commercial/industrial exposure scenario.

The RSLs are based on a 1E-05 (1 x 10-5) target carcinogenic risk for current and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

-- : Not available

NA = Not analyzed

B = The analyte was detected in the associated method and/or calibration blank.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

µg/m = Micrograms per Cubic Meter

Bold indicates the analyte was detected

Shading indicates the result exceeded screening criteria (Note there are no representative cases)

DRAFT

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Table 2–2. Convocation Center Area Sampling Results Vapor Intrusion Investigation West Virginia State University , Institute, West Virginia

vvest virginia state Oniversity, iristitut	,	rgiriid			Outd	loor Air	Crawl	Space Air									Indoor Air										Exterior Soil Gas	s
	T			Location>>		CC-AA01		CC-CS01	INST-CC-IA01	INST-CC-IA02	INST-CC-IA03	INST-CC-IA04	INST-CC-IA05	INST-CC-IA06		CC-IA07	INST-CC-IA08	INST-CC-IA09	INST-CC-IA10	INST-CC-IA11	INST-CC-IA12	INST-CC-IA13		CC-IA14	INST-CC-IA15		INS-0572	
	1 1			Sample ID>> Sample Depth (feet)>>	CC-AA1-06202015 0-0	CC-AA1-06202015D 0-0	CC-CS1-06202015 0-0	0-0	CC-IA1-06202015 0-0	CC-IA2-06202015 0 - 0	CC-IA3-06202015 0 - 0	CC-IA 4-06202015 0 - 0	CC-IA5-06202015 0 - 0	CCHA6-06202015 0 - 0	CCHA7-06202015 0 - 0	CC-IA7-06202015D 0 - 0	0 - 0 CC-IA8-06202015	CC-IA9-06202015 0-0	CCHA10-06202015 0-0	CC-IA11-06202015 0-0	CC-IA12-06202015 0-0	CC-IA13-06202015 0-0	CC-IA14-06202015 0 - 0	CC-IA14-06202015D 0-0	CC-IA15-06202015 0-0	0572-01-012016 5-6	0572-02-020516 12-13	0572-02-0205165 12 - 13
	1 1			Sample Date>>	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	1/20/2016	2/5/2016	2/5/2016
			Screening Levels ^{a,b}																			1						, ,
Anaiyte	Unit	Commercial/Industrial Indoor Air RSL	Commercial/Industria Soil Gas VISL	Residential Soil Gas VISL																								, ,
1,1,1-Trichloroethane	μg/m³	22000	730000	170000																						4.91 U	4.91 U	5.5 UJ
1,1,2,2-Tetrachloroethane	µg/m³	2.1	70	1.6																						6.18 U	6.18 U	6.9 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane 1,1,2-Trichloroethane	ug/m	130000 0.88	4400000 29	1000000 5.8																						6.9 U 4.91 U	6.9 U 4.91 U	15 UJ 5.5 UJ
1,1-Dichloroethane	µg/m³	77	2600	58	0.17 U	0.156 U	0.168 U	0.152 U	0.149 U	0.155 U	0.156 U	0.159 U	0.152 U	0.147 U	0.148 U	0.147 U	0.154 U	0.143 U	0.145 U	0.156 U	0.18 U	0.166 U	0.155 U	0.162 U	0.137 UJ	3.64 U	3.64 U	4 UJ
1,1-Dichloroethene	µg/m³	880	29000	7000	0.167 U	0.152 U	0.165 U	0.149 U	0.146 U	0.152 U	0.152 U	0.156 U	0.149 U	0.144 U	0.145 U	0.144 U	0.151 U	0.14 U	0.142 U	0.152 U	0.177 ∪	0.163 U	0.152 U	0.159 U	0.134 UJ	3.57 U	3.57 U	4 UJ
1,2,4-Trichlorobenzene 1,2,4-Trimethylbenzene	µg/m³	8.8 31	290 1000	70 240																						6.68 U 4.43 U	6.68 U 4.43 U	15 UJ 4.9 UJ
1,2-Dibromoethane (EDB)	ug/m³	0.2	6.8	0.16																						6.92 U	6.92 U	7.7 UJ
1,2-Dichlorobenzene	μg/m³	880	29000	7000																						5.41 U	5.41 U	6 UJ
1,2-Dichloroethane	µg/m³	4.7	160	3.6																						3.64 U	3.64 U	4 U.)
1,2-Dichloropropane 1,2-Dichlorotetrafluoroethane	μg/m³	12 NA	410 NA	9.4 NA																						4.16 U 6.29 U	4.16 U 6.29 U	4.6 UJ 7 UJ
1,3,5-Trimethylbenzene	ug/m³	NA NA	NA.	NA NA																						4.43 U	4.43 U	4.9 UJ
1,3-Dichlorobenzene	μg/m³	NA .	NA	NA NA																						5.41 U	5.41 U	6 UJ
1,4-Dichlorobenzene	µg/m³	11	370	8.5																						5.41 U	5.41 U	6 U J
1,4-Dioxane (p-Dioxane) 2-Butanone	µg/m²	25 22000	820 730000	19 170000	3.81 U	3.46 U	3.74 U	3.39 U	3.32 U	3.45 U	3.46 U	3.54 U	3.39 U	3.28 U	3.3 U	7.44 J	3.43 U	3.19 U	3.23 U	3.46 U	4.03 U	3.7 ∪	3.45 U	3.61 U	3.04 UJ	3.24 U 30.9	3.24 U 2.65 U	3.6 UJ 5.9 UJ
2-Hexanone	ug/m³	130	4400	1000																						3.69 U	3.69 U	8.2 UJ
2-Methylnaphthalene	µg/m³	NA	NA	NA																						5.24 U	5.24 U	
4-Methyl-2-pentanone	µg/m³	13000	440000	100000																						3.69 U	3.69 U	8.2 UJ
Acetone Acrylonitrile	ug/m'	140000 1.8	4500000 60	1100000 1.4																						130 1.95 U	6.98 NJ 1.95 U	6.8 J 4.3 UJ
Benzene	μg/m³	16	520	12	0.673 U	0.614 U	0.663 U	0.601 U	0.588 U	0.611 U	0.614 U	0.627 U	0.601 U	0.582 U	0.585 U	0.582 U	0.608 U	0.566 U	0.572 U	0.614 U	0.712 U	0.657 U	0.611 U	0.64 U	0.54 UJ	38	2.88 U	3.2 UJ
Benzył chloride	µg/m³	2.5	83	1.9																						4.66 U	4.66 U	5.2 UJ
Bis (2-chloroisopropyl) ether	µg/m³	NA	NA 440	NA 3.5																						6.3 U	6.3 U	
Bromodichloromethane Bromoform	ug/m²	3,3 110	110 3700	2.5 85																						6.03 U 9.3 U	6.03 U 9.3 U	6.7 UJ 10 UJ
Bromomethane	µg/m³	22	730	170																						3.5 U	3.5 U	3.9 UJ
Carbon disulfide	μg/m³	3100	100000	24000																						28.5	2.8 U	3.1 UJ
Carbon tetrachloride	µg/m"	20	680 7300	16 1700					0.4711	0.57613	0.477.0	0.505.11			0.10011		0.575.0					0.50011	0.5761)		 0.155 UJ	5.66 U	5.66 U	6.3 U)
Chlorobenzene Chloroethane	μg/m ug/m ³	220 44000	1500000	350000	0.194 U 	0.177 U	0.191 U 	0.173 U	0.17 U	0.176 U 	0.177 U 	0.181 U	0.173 U 	0.168 U	0.169 U	0.312	0.175 U 	0.163 U	0.165 U	0.177 U 	0.205 U	0.189 U	0.176 U	0.184 U	U.155 UJ	4.14 U 2.38 U	4.14 U 2.38 U	4.6 UJ 2.6 UJ
Chloroform	µg/m³	5.3	180	4.1	0.206 U	0.188 U	0.203 U	0.184 U	0.18 U	0.187 U	0.188 U	0.192 U	0.256	0.178 U	0.179 U	0.178 U	0.186 U	0.173 U	0.175 U	0.188 U	0.218 U	0.201 U	0.187 U	0.196 U	0.165 UJ	4.4 U	4.4 U	4.9 UJ
Chloromethane	μg/m³	390	13000	3100																						1.86 U	1.86 U	2.1 UJ
cis-1,2-Dichloroethylene cis-1,3-Dichloropropene	µg/m³	NA NA	NA NA	NA NA																						3.57 U 4.09 U	3.57 U 4.09 U	4 U J 4.5 U J
Dibromochloromethane	us/m³	NA NA	NA.	NA NA						==																7.67 U	7.67 U	4.5 UJ
Dichlorodifluoromethane	µg/m³	440	15000	3500																						418	172	2103
Ethylbenzene	µg/m³	49	1600	37																						6.67	3.91 U	4.3 UJ
Hexachlorobutadiene m,p-Xylene	µg/m²	5.6 440	190 15000	4.3 3500																						9.49 U 14.9	9.49 U 7.82 U	21 U J 8 J
Methylene chloride	ug/m³	2600	88000	3400																						3.13 U	3.13 U	3.5 UJ
n-Butylbenzene	µg/m³	NA	NA	NA																						4.94 U	4.94 U	5.5 UJ
n-Hexane	µg/m³	3100	100000	24000																						55.6	3.17 U	3.5 UJ
n-Propylbenzene Naphthalene	μg/m²	4400 3.6	150000 120	35000 2.8																						4.42 U 4.72 U	4.42 U 4.72 U	4.9 UJ 5.2 UJ
o-Xylene	ug/m³	440	15000	3500																						5.12	3.91 U	5.1 J
Styrene	μg/m³	4400	150000	35000																						3.83 U	3.83 U	4.3 U i
tert-Butyl Methyl Ether	µg/m³	470	16000	360																						3.25 U	3.25 U	3.6 UJ
Tetrachloroethene Toluene	ug/m"	180 22000	5800 730000	360 170000																						6.11 U 27.6	6.11 U 3.39 U	6.8 UJ 3.8 UJ
Trans-1,2-Dichloroethylene	µg/m³	NA NA	NA.	NA NA																						3.57 U	3.57 U	4 U J
trans-1,3-Dichloropropene	µg/m³	NA	NA	NA																						4.09 U	4.09 U	4.5 UJ
Trichloroethylene	μg/m³	8.8	290	16					l		l . <u></u>	l . <u></u>		l							l		I			4.83 U	4.83 U	5.4 UJ
Trichlorofluoromethane Vinyl acetate	µg/m²	NA 880	NA 29000	NA 7000	0.886	1.09	5.49	5	1.4	1.19	1.54	1.54	1.16	1.14	1.85	1.65	1.27	1.19	1.23	1.22	1.17	4.74	10.7	9.77	1.94 J	20.8 3.17 U	8.06 3.17 U	11 J 3.5 UJ
Vinyl chloride	µg/m³	28	930	7.7																						2.3 U	2.3 U	2.6 UJ
VOCs, Total	µg/m³	NA	NA	NA	0.886	1.09	5.49	5	1.4	1.19	1.54	1.54	1.416	1.14	1.85	9.402	1.27	1.19	1.23	1.22	1.17	4.74	10.7	9.77	1.94	776.09	187.04	240.9

- Notes:
 a. Screening levels are based on USEPA regional screening levels (RSLs, USEPA 2015b) for indoor air for a commercial/industrial exposure scenario.
 The RSLs are based on a 1E-05 (1 x 10) larget carcinogenic risk for current exposure scenarios and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001)
 b. Soil gas screening levels be based on USEPA (2015c) vapor intrinsion screening levels (VISLs) (VISLs are based on time temporary levels) (VISLs are based on time temporary levels (VISLs) (VISLs are based on time temporary levels) (VISLs are ba

- TW = TWU tertiastors

 NJ = The analysis indicates the presence of an analyse that has been fentatively identified and the associated numerical value represents its approximate concentration.

 U = The analyse was analyzed for, but was not detected above the reported sample quantitation limit.

 U = The analyse was below the reported sample quantitation limit. However, the reported value is approximate.

 µg/m² = Micrograms per Cubic Meter

Bold indicates the analyte was detected

Shading indicates the result exceeded Commercial/Industrial Indoor Air RSL (Note there are no representative cases)

Blue colored results indicate concentration was detected above the Commercial/Industrial Soil Gas VISL (Note there are no representative cases)

Italicized results indicate concentration was detected above the Residential Soil Gas VISL

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Table 2-3. Eastern Area Sampling Results

Vapor Intrusion Investigation West Virginia State University, Institute, West Virginia

		<u> </u>	Location>>	IAIC_	0569		INS-0571	
			Sample ID>>	0569-01-011516	0569-02-011416	0571-01-020516	0571-01-020516S	0571-02-012016
			Sample Depth (feet)>>	5-6	13 - 14	5-6	5-6	11 - 12
			Sample Depth (reet/>>	1/15/2016	1/14/2016	2/5/2016	2/5/2016	1/20/2016
		RBS	•	1,10,2010	1,14,2010	2,3,2010	2,3,2010	1, 20, 2010
		Commercial/Industrial	Residential					
Analyte	Unit	Soil Gas VISL	Soil Gas VISL					
1,1,1-Trichloroethane	μg/m³	730000	170000	4.99 U	5.38 U	4.77 U	5.5 UJ	4.55 UJ
1,1,2,2-Tetrachloroethane	μg/m³	70	1.6	6.28 U	6.77 U	6.01 U	6.9 UJ	5.73 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane	$\mu g/m^3$	4400000	1000000	7.02 U	7.56 U	6.7 U	15 UJ	6.39 UJ
1,1,2-Trichloroethane	$\mu g/m^3$	29	5.8	4.99 U	5.38 U	4.77 U	5.5 UJ	4.55 UJ
1,1-Dichloroethane	μg/m³	2600	58	3.71 U	3.99 U	3.54 U	4 UJ	3.38 UJ
1,1-Dichloroethene	$\mu g/m^3$	29000	7000	3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
1,2,4-Trichlorobenzene	μg/m³	290	70	6.79 U	7.32 U	6.49 U	15 UJ	6.19 UJ
1,2,4-Trimethylbenzene	μg/m³	1000	240	13.2	4.85 U	4.3 U	6.8 J	21.4 J
1,2-Dibromoethane (EDB)	$\mu g/m^3$	6.8	0.16	7.03 U	7.58 U	6.72 U	7.7 UJ	6.41 UJ
1,2-Dichlorobenzene	$\mu g/m^3$	29000	7000	5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,2-Dichloroethane	$\mu g/m^3$	160	3.6	3.71 U	3.99 U	3.54 U	4 UJ	3.38 UJ
1,2-Dichloropropane	$\mu g/m^3$	410	9.4	4.23 U	4.56 U	4.04 U	4.6 UJ	3.85 UJ
1,2-Dichlorotetrafluoroethane	$\mu g/m^3$	NA	NA	6.4 U	6.9 U	6.12 U	7 UJ	5.83 UJ
1,3,5-Trimethylbenzene	$\mu g/m^3$	NA	NA	5.35	4.85 U	4.3 U	17 J	7.3 J
1,3-Dichlorobenzene	$\mu g/m^3$	NA	NA	5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,4-Dichlorobenzene	$\mu g/m^3$	370	8.5	5.5 U	5.93 U	5.26 U	6 UJ	5.01 UJ
1,4-Dioxane (p-Dioxane)	$\mu g/m^3$	820	19	3.3 U	3.56 U	3.15 U	3.6 UJ	3.01 UJ
2-Butanone	$\mu g/m^3$	730000	170000	9.45	24.4	2.58 U	5.9 UJ	3.39 J
2-Hexanone	$\mu g/m^3$	4400	1000	3.75 U	4.04 U	3.58 U	8.2 UJ	3.42 UJ
2-Methylnaphthalene	$\mu g/m^3$	NA	NA	5.32 U	5.74 U	5.09 U		4.85 UJ
4-Methyl-2-pentanone	$\mu g/m^3$	440000	100000	3.75 U	4.04 U	3.58 U	8.2 UJ	3.42 UJ
Acetone	$\mu g/m^3$	4500000	1100000	8.65 NJ	108 NJ	19.3	11 B	14.8 J
Acrylonitrile	$\mu g/m^3$	60	1.4	1.99 U	2.14 U	1.9 U	4.3 UJ	1.81 UJ
Benzene	$\mu g/m^3$	520	12	2.92 U	4.88 NJ	2.79 U	3.2 UJ	2.66 UJ
Benzyl chloride	$\mu g/m^3$	83	1.9	4.74 U	5.11 U	4.53 U	5.2 UJ	4.32 UJ
Bis (2-chloroisopropyl) ether	$\mu g/m^3$	NA	NA	6.4 U	6.9 U	6.12 U		5.84 UJ
Bromodichloromethane	$\mu g/m^3$	110	2.5	6.13 U	6.61 U	5.86 U	6.7 UJ	5.59 UJ
Bromoform	$\mu g/m^3$	3700	85	9.46 U	10.2 U	9.04 U	10 UJ	8.62 UJ
Bromomethane	$\mu g/m^3$	730	170	3.55 U	3.83 U	3.4 U	3.9 UJ	3.24 UJ
Carbon disulfide	μg/m³	100000	24000	2.85 U	3.07 U	2.72 U	3.7 J	2.6 UJ
Carbon tetrachloride	$\mu g/m^3$	680	16	5.76 U	6.21 U	5.5 U	6.3 UJ	5.25 UJ
Chlorobenzene	$\mu g/m^3$	7300	1700	4.21 U	4.54 U	4.03 U	4.6 UJ	3.84 UJ
Chloroethane	$\mu g/m^3$	1500000	350000	2.42 U	2.6 U	2.31 U	2.6 UJ	2.2 UJ
Chloroform	$\mu g/m^3$	180	4.1	4.47 U	4.82 U	4.27 U	4.9 UJ	4.07 UJ
Chloromethane	μg/m³	13000	3100	1.89 U	2.04 U	1.81 U	2.1 UJ	1.72 UJ
cis-1,2-Dichloroethylene	$\mu g/m^3$	NA	NA	3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
cis-1,3-Dichloropropene	μg/m³	NA	NA	4.15 U	4.48 U	3.97 U	4.5 UJ	3.79 UJ

Table 2-3. Eastern Area Sampling Results

Vapor Intrusion Investigation

West Virginia State University, Institute, West Virginia

Dibromochloromethane	μg/m³	NA	NA	7.8 U	8.4 U	7.45 U	8.5 UJ	7.1 UJ
Dichlorodifluoromethane	μg/m ³	15000	3500	4.53 U	4.88 U	4.33 U	4.9 UJ	4.12 UJ
Ethylbenzene	μg/m³	1600	37	4.86	4.28 U	3.8 U	5.5 J	3.62 UJ
Hexachlorobutadiene	μg/m ³	190	4.3	9.65 U	10.4 U	9.22 U	21 UJ	8.79 UJ
m,p-Xylene	μg/m³	15000	3500	25.1	8.57 U	7.6 U	9.4 j	7.24 UJ
Methylene chloride	μg/m³	88000	3400	3.18 U	3.43 U	3.04 U	3.5 UJ	2.9 UJ
n-Butylbenzene	μg/m³	NA	NA	5.03 U	5.42 U	4.8 U	5.5 UJ	4.58 UJ
n-Hexane	μg/m³	100000	24000	3.23 U	13.7 NJ	3.08 U	3.5 UJ	2.94 UJ
n-Propylbenzene	$\mu g/m^3$	150000	35000	4.5 U	4.85 U	4.3 U	4.9 UJ	4.1 UJ
Naphthalene	μg/m³	120	2.8	4.8 U	5.17 U	4.59 U	5.2 UJ	4.37 UJ
o-Xylene	μg/m³	15000	3500	7.55	4.28 U	3.8 U	9.5 J	3.62 UJ
Styrene	$\mu g/m^3$	150000	35000	3.9 U	4.2 U	3.73 U	4.3 UJ	3.55 UJ
tert-Butyl Methyl Ether	μg/m³	16000	360	3.3 U	3.56 U	3.15 U	3.6 UJ	3.01 UJ
Tetrachloroethene	$\mu g/m^3$	5800	360	6.21 U	27	5.93 U	6.8 UJ	5.66 UJ
Toluene	μg/m³	730000	170000	18.9	53.7	3.3 U	5.5 J	3.14 UJ
Trans-1,2-Dichloroethylene	$\mu g/m^3$	NA	NA	3.63 U	3.91 U	3.47 U	4 UJ	3.31 UJ
trans-1,3-Dichloropropene	μg/m³	NA	NA	4.15 U	4.48 U	3.97 U	4.5 UJ	3.79 UJ
Trichloroethylene	μg/m³	290	16	4.92 U	5.3 U	4.7 U	5.4 UJ	4.48 UJ
Trichlorofluoromethane	$\mu g/m^3$	NA	NA	5.89	10.6	4.91 U	5.6 UJ	4.69 UJ
Vinyl acetate	$\mu g/m^3$	29000	7000	3.22 U	3.47 U	3.08 U	3.5 UJ	2.94 UJ
Vinyl chloride	μg/m³	930	7.7	2.34 U	2.52 U	2.24 U	2.6 UJ	2.13 UJ
VOCs, Total	$\mu g/m^3$	NA	NA	98.95	242.28	19.3	68.4	46.89

Notes:

- a: Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03,
 - a 1E-06 (1 x 10-6) target carcinogenic risk for hypothetical, future residential exposure, a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 200
- - = Not analyzed
- J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

NA = Not available

NJ = The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.

µg/m3 = Micrograms per Cubic Meter

Bold indicates the analyte was detected

Blue colored results indicate concentration was detected above the Commercial/Industrial Soil Gas VISL (Note there are no representative cases)

 $Italicized\ results\ indicate\ concentration\ was\ detected\ above\ the\ Residential\ Soil\ Gas\ VISL\ (Note\ there\ are\ no\ representative\ cases)$

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Table 2-4. Faculty Housing Area Sampling Results Vapor Intrusion Investigation West Virginia State University, Institute, West Virginia

vvost virgina otate oraversky, notitate						Outdoor Air			Subslab !	Soil Vapor			Crawl Space Air						
				Location>>		INST-FR-AA01			INST-FR-SS01		INST-FR-SS02		INST-FR-CS01		INST-FR	HA01	INST-FF	RHA02	
				Sample ID>>	FR-AA1-06192015	FR-AA1-012616	FR-AA01-012716S	FR-SS01-012916S	FR-SS01-020316	FR-SS01-020416S	FR-SS02-020316	FR-CS1-012616	FR-CS1-012616D	FR-CS01-012716S	FR-IA1-06192015	FR-IA1-012616	FR-IA2-06192015	FR-IA2-012716	FR-IA3-06192015
				Sample Depth (feet)>> Sample Date>>	0-0 6/20/2015	0-0 1/26/2016	0-0 1/26/2016	0-0 1/28/2016	0-0 2/3/2016	0-0 2/3/2016	0-0 2/3/2016	0-0 1/26/2016	0-0 1/26/2016	0-0 1/26/2016	0-0 6/20/2015	0-0 1/26/2016	0-0 6/20/2015	0-0 1/27/2016	0-0 6/20/2015
			Screening Levels a,b	Sample Date//	0/20/2013	1/20/2010	1/20/2010	1/26/2010	2/3/2010	2/3/2010	2/3/2010	1/20/2010	1/20/2010	1/20/2010	0/20/2013	1/20/2010	0/20/2013	1/2//2010	0/20/2013
		Residential	Commercial/Industrial	Residential															
Analyte	Unit	Indoor Air RSL	Soil Gas VISL	Soil Gas VISL															
1,1,1-Trichloroethane	μg/m ³	5200	730000	170000		0.188 UJ	0.273 UJ	0.273 UJ	4.8 U	5.5 U	5.44 U	0.19 U	0.19 U	0.273 U		0.222 U		0.206 ป	
1,1,2,2-Tetrachloroethane	µg/m³	0.048	70	1.6		0.236 UJ	6.9 UJ	6.9 ₩	6.04 U	6.9 U	6.84 U	0.239 U	0.239 ⊍	6.9 U		0.279 U		0.26 ∪	
1,1,2-Trichloro-1,2,2-trifluoroethane	μg/m ³	31000	4400000	1000000		0.51 J	0.787 J	0.805 J	6.74 U	15 U	7.64 U	0.506	0.531	0.775		0.552		0.512	
1,1,2-Trichloroethane	µg/m³	0.18	29	5.8		0.188 UJ	0.273 UJ	0.273 UJ	4.8 U	5.5 8	5.44 U	0.19 U	0.19 U	0.273 U		0.222 U		0.206 U	
1,1-Dichloroethane 1,1-Dichloroethene	μg/m³ ug/m³	1.8 210	2600 29000	58 7000	0.152 U 0.149 U	0.139 U) 0.136 U)	0.202 UJ 0.198 UJ	0.202 UJ 0.198 UJ	3.56 U 3.49 U	4 U 4 U	4.03 U 3.95 U	0.141 U 0.138 U	0.141 U 0.138 U	0.202 U 0.198 U	0.152 U 0.205	0.165 U 0.161 U	0.164 U 0.201	0.153 U 0.15 U	0.146 U 0.213
1,2,4-Trichlorobenzene	ug/m ³	2.1	2900	7000	0.145 0	0.255 UJ	15 UJ	15 UJ	6.53 U	15 U	7.4 U	0.258 U	0.366	15 U	0.203	0.302 U		0.281 U	
1,2,4-Trimethylbenzene	μg/m ³	7.3	1000	240		0.169 UJ	0.246 UJ	1.11 J	4,33 U	4.9 U	4.9 U	0.171 U	0.241	0.246 U		0.246		0.186 U	
1,2-Dibromoethane (EDB)	μg/m ³	0.0047	6.8	0.16		0.264 UJ	0.384 UJ	0.384 UJ	6.76 U	7.7 U	7.66 ∪	0.267 U	0.267 ∪	0.384 U		0.313 U		0.291 U	
1,2-Dichlorobenzene	μg/m ³	210	29000	7000		0.207 UJ	0.301 UJ	0.301 UJ	5.29 U	6 U	5.99 U	0.209 U	0.209 U	0.301 U		0.245 U		0.228 U	
1,2-Dichloroethane	μg/m³	0.11	160	3.6		0.139 ປ)	0.202 ปร	0.202 UJ	3.56 U	4 U	4.03 U	0.141 U	0.141 U	0.202 U		0.165 U	-	0.153 €	
1,2-Dichloropropane	μg/m³	0.28	410	9.4		0.159 UJ	0.231 UJ	0.231 UJ	4.07 U	4.6 U	4.61 U	0.161 U	0.161 U	0.231 U		0.188 U		0.175 U	
1,2-Dichlorotetrafluoroethane	μg/m ³	NA	NA	NA		0.24 UJ	7 UJ	7 UJ	6.15 U	7 U	6.97 U	0.243 U	0.243 U	7 U		0.284 U		0.265 U	
1,3,5-Trimethylbenzene	μg/m ³	NA NA	NA 	NA 		0.169 UJ	4.9 UJ	4.9 UJ	4.33 U	4.9 U	4.9 U	0.171 U	0.171 U	4.9 U		0.2 U		0.186 U	
1,3-Dichlorobenzene	μg/m ³	NA 0.26	NA 370	NA o E		0.207 UJ	0.301 UJ	0.301 UJ	5.29 U	6 U	5.99 U	0.209 U	0.209 U	0.301 U		0.245 U		0.228 U	
1,4-Dichlorobenzene 1,4-Dioxane (p-Dioxane)	μg/m ³ μg/m ³	0.26 0.56	370 820	8.5 19	3.39 U	0.207 UJ 3.1 UJ	0.301 UJ 3.6 UJ	0.786 J 3.6 UJ	5.29 U 3.17 U	6 U 3.6 U	5.99 U 3.59 U	0.209 U 3.13 U	0.209 U 3.13 U	0.301 U 3.6 U	3.39 U	0.245 U 3.7 U	3.65 U	0.228 U 3.41 U	3.24 U
2-Butanone	μg/m³	6.56 5200	730000	170000	3.39 U	0.663 J	5.9 UI	5.9 U1	2.59 U	5.9 U	3.59 U 2.94 U	1.25 J	0.696 J	5.9 U	3.39 0	0.861	3.03 0	1.84	5.24 0
2-Hexanone	µg/m ³	31	4400	1000		3.52 UJ	8.2 UJ	8.2 UJ	3.6 U	8.2 U	4.08 U	3.56 U	3.56 U	8.2 U		4.2 U		3.88 U	
2-Methylnaphthalene	μg/m ³	NA NA	NA	NA		10 UJ			5.12 U		5.8 U	10.1 U	10.1 U			11.8 U		11 U	
4-Methyl-2-pentanone	μg/m ³	3100	440000	100000		3.3 J	8.2 UJ	8.2 UJ	3.6 U	8.2 U	4.08 U	2.33	2.2	8.2 U		2.79		3.04	
Acetone	μg/m³	32006	4500000	1100000		11.2 J	21 J	26 J	2.09 ∪	7.2	2.37 U	12.5 J	9.76 J	18		13.1 J		8.12 J	
Acrylonitrile	μg/m³	0.041	60	1.4		1.87 UJ	0.109 UJ	0.109 UJ	1.91 U	4.3 U	2.16 U	1.89 UJ	1.89 UJ	0.109 U		2.2 UJ		2.05 UJ	
Benzene	μg/m ³	0.36	520	12	0.601 U	0.601 J	0.855 J	0.674 J	2.81 U	3.2 U	3.18 U	0.585	0.627	0.822	0.601 U	0.709	0.647 U	0.942	0.585
Benzyl chloride	µg/m²	0.057	83	1.9		0.178 UJ	5.2 UJ	5.2 0)	4.56 U	5.2 €	5.16 U	0.218	0.18 U	5.2 €		0.211 U		0.196 U	
Bis (2-chloroisopropyl) ether	μg/m³	NA 0.076	NA 110	NA 2.5		6.01 UJ	0.225.411	0.225 (1)	6.16 U		6.97 U 6.68 U	6.08 U	6.08 U	0.225 ()		7.1 U		6.62 U 0.254 U	
Bromodichloromethane Bromoform	µg/m² µg/m³	2.6	110 3700	2.5 85		0.23 UJ 1.78 UJ	0.335 UJ 10 UJ	0.335 UJ 10 UJ	5.9 U 9.09 U	6.7 U 10 U	10.3 U	0.233 U 1.8 U	0.233 U 1.8 U	0.335 U 10 U		0.273 U 2.1 U		1.96 U	
Bromomethane	ug/m ³	5.2	730	170		0.668 U)	3.9 UJ	3.9 UI	3.42 U	3.9 U	3.87 U	0.675 U	0.675 U	3.9 U		0.79 U		0.735 U	
Carbon disulfide	µg/m³	730	100000	24000		0.107 UI	3.1 U)	8.8 J	2.74 U	3.1 U	3.1 U	0.108 U	0.108 U	3.1 U		0.127 U		0.118 U	
Carbon tetrachloride	μg/m³	0.47	680	16		2.16 UJ	0.752 J	0.763 J	5.54 U	6.3 U	6.27 ∪	2.19 U	2.19 U	0.754		2.56 U		2.38 U	
Chlorobenzene	µg/m³	52	7300	1700	0.173 U	0.158 UJ	4.6 UJ	4.6 UJ	4.05 U	4.6 U	4.59 U	0.16 U	0.16 U	4.6 U	0.173 U	0.187 U	0.186 U	0.174 U	0.166 U
Chloroethane	μg/m ³	10000	1500000	350000		0.0907 ปัง	0.132 UJ	0.132 UJ	2.32 U	2.6 U	2.63 U	0.0918 U	0.0918 U	0.132 U		0.107 U	-	0.0999 U	
Chloroform	μg/m ³	0.12	180	4.1	0.184 U	0.168 UJ	0.244 UJ	0.542 J	4.3 U	4.9 U	4.87 ⊍	0.17 ∪	0.17 U	0.244 U	0.184 ⊍	0.199 U	0.198 U	0.185 U	0.176 ∪
Chloromethane	μg/m ³	94	13000	3100		1.77 UJ	2.1 UJ	2.1 UJ	1.82 U	2.1 U	2.06 U	1.8 ∪	1.8 U	2.1 U		2.1 U		1.95 U	
cis-1,2-Dichloroethylene	μg/m³	NA-	NA	NA		0.136 UJ	0.198 UJ	0.198 UJ	3.49 €	4 U	3.95 U	0.138 U	0.138 U	0.198 U		0.161 U		0.15 U	
cis-1,3-Dichloropropene Dibromochloromethane	µg/m³ µg/m³	NA NA	NA NA	NA NA		0.156 UJ 0.293 UJ	4.5 UJ 8.5 UJ	4.5 UI 8.5 UI	3.99 U 7.49 U	4.5 U 8.5 บ	4.52 U 8.49 U	0.158 U 0.296 U	0.158 U 0.296 U	4.5 U 8.5 U		0.185 U 0.347 U		0.172 U 0.322 U	
Dichlorodifluoromethane	μg/m μg/m ³	NA 100	NA 15000	3500		0.293 0) 2.39 J	3.75 J	3.64 J	7.49 U	8.5 U 4.9 U	4.93 U	0.296 U	0.296 0 2.5 J	8.5 U 3.64 J		2.54		0.322 U	
Ethylbenzene	μg/m μg/m ³	11	1600	37		0.149 UI	0.281 J	2.23 J	3.82 U	4.3 U	4.33 U	0.151 U	0.163	0.504		0.177 U		0.408	
Hexachlorobutadiene	μg/m ³	0.13	190	4.3		0.363 UJ	21 (1)	21 UJ	9.28 U	21 U	10.5 U	0.367 U	0.367 U	21 U		0.429 U		0.399 U	
m,p-Xylene	μg/m ³	100	15000	3500		0.39 J	0.755 J	7.03 J	7.64 U	4.3 U	8.66 U	0.455	0.49	1.32		0.481		1.51	
Methylene chloride	μg/m³	100	88000	3400		5.97 UJ	0.866 J	320 J	3.06 U	3.5 U	3.46 U	6.04 U	6.04 U	4.1		7.1 U		6.57 U	
n-Butylbenzene	μg/m ³	NA NA	NA	NA		0.189 UJ	5.5 UJ	5.5 ⊎J	4.83 U	5.5 U	5.47 U	0.191 U	0.191 U	5.5 ∪		0.223 U		0.208 ∪	
n-Hexane	μg/m ³	730	100000	24000		0.649 J	3.5 UJ	8.8 J	3.1 U	3.5 U	3.51 U	0.67	0.771	3.5 U		1.15		1.69	
n-Propylbenzene	μg/m ³	1000	150000	35000		0.169 UJ	4.9 UJ	4.9 UJ	4.32 U	4.9 U	4.9 U	0.171 U	0.171 U	4.9 U		0.2 U		0.186 U	
Naphthalene	μg/m ³	0.083 100	120 15000	2.8 3500		0.18 UJ 0.149 UJ	0.262 UJ	0.368 J	4.61 U	5.2 U	5.23 U	0.182 U	0,581 J	0.262 U		0.736		0.198 U	
o-Xylene Styrene	μg/m³	100 1000	15000 150000	3500 35000		0.149 UJ 0.146 UJ	0.423 J 0.213 UJ	4.03 J 0.213 UJ	3.82 U 3.75 U	4.3 U	4.33 U 4.25 U	0.197 0.148 U	0.193 0.148 U	0.831 0.213 U		0.201 0.173 U		0.574 0.161 U	
Styrene tert-Butvi Methvi Ether	μg/m ³ μg/m ³	11	150000	35000		0.146 03	0.213 01	0.213 UJ 0.192 J	3.75 U 3.17 U	4.3 U	4.25 U 3.59 H	0.148 U 0.125 U	0.148 U	0.213 0		0.173 0		0.161 0	
Tetrachloroethene	µg/m µg/m³	11 11	18000 5800	360		0.124 UJ	0.339 UJ	7.45 J	5.97 U	5.6 U	6.76 U	0.125 U	0.236 U	0.339 U		0.147 U		0.136 U	
Toluene	ug/m³	5200	730000	170000		0.617 J	0.983 J	3.91 J	3.32 U	3.8 U	3.76 U	1.43	1.51	2.12		1.46		1.98	
Trans-1,2-Dichloroethylene	μg/m ³	NA NA	NA NA	NA NA		0.136 UJ	0.198 UJ	0.198 UJ	3.49 U	4 U	3.95 U	0.138 U	0.138 U	0.198 U		0.161 U		0.15 U	
trans=1,3-Dichloropropene	μg/m ³	NA NA	N.A.	NA		0.156 UJ	4.5 UJ	4.5 UJ	3.99 U	4.5 U	4.52 U	0.158 U	0.158 U	4.5 U		0.185 U		0.172 ⊍	
Trichloroethylene	µg/m³	0.48	290	16		0.185 U	0.269 UJ	0.269 UJ	4.72 U	5.4 U	5.35 U	0.187 ∪	0.187 U	0.269 U		0.218 ∪		0.203 U	
Trichlorofluoromethane	μg/m³	NA .	NA	NA	0.972	1.17 J	5.6 UJ	5.6 UJ	6	19	7.6	1.18	1.26	5.6 U	1.17	1.27	1.1	1.3	1.17
Vinyl acetate	μg/m³	210	29000	7000		0.303 UJ	3.5 UJ	3.5 UJ	3.1 ∪	3.5 U	3.51 U	0.306 ป	0.306 U	3.5 €		0.358 ป		0.333 ป	
Vinyl chloride	μg/m ³	0.17	930	7.7		0.0879 UJ	0.128 UJ	0.128 UJ	2.25 U	2.6 ∪	2.55 U	0.0889 U	0.0889 U	0.128 U		0.104 U		0.0967 U	
VOCs, Total	μg/m³	NA NA	NA	NA	0.972	21.49	30.452	396.762	6	26.2	7.6	23.701	21.308	32.866	1.375	25.36	1.301	21.916	1.968

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Table 2-4. Faculty Housing Area Sampling Results Vapor Intrusion Investigation West Virginia State University, Institute, West Virginia

				•			Indoor Air											Exte	rior Soil Gas			
				Location>>		IST-FR-IA03		INST-FR		INST-FR			INST-FR-IA06		INS-			0562		i - 0564		S-0565
				Sample ID>> Sample Depth (feet)>>	FR-IA3-012616 0-0	FR-IA03-012716S 0-0	FR-IA03-012716DS 0-0	FR-IA4-06192015 0-0	FR-IA4-012616 0-0	FR-IA5-06222015 0-0	FR-IA5-012616 0-0	FR-IAG-06192015 0-0	FR-IAG-06192015D 0-0	FR-IAG-012616 0-0	0560-01-011416 5-6	0560-02-011316 16-17	0562-01-011416 5-6	0562-02-011416 11-12	0564-01-011416 5-6	0564-02-020516S 17.5 - 18.5	0565-02-011916 16-17	0565-02-011916/D 16-17
				Sample Date>>	1/26/2016	1/26/2016	1/26/2016	6/20/2015	1/26/2016	6/23/2015	1/26/2016	6/20/2015	6/20/2015	1/26/2016	1/14/2016	1/13/2016	1/14/2016	1/14/2016	1/14/2016	2/5/2016	1/19/2016	1/19/2016
		Residential	Screening Levels 8,0 Commercial/Industrial	Residential																		
Analyte	Unit	Indoor Air RSL	Soil Gas VISL	Soil Gas VISL																		
1,1,1-Trichloroethane	μg/m³	5200	730000	170000	0.214 U	0.273 U	0.273 U		0.185 UJ		0.181 UJ			0.216 U	5.11 U	4.72 UJ	5.77 ป	4.94 U	5.05 U	5.5 U	9.77 U	9.71 ⊍
1,1,2,2-Tetrachloroethane	µg/m³	0.048	70	1.6	0.27 U	6.9 U	6.9 U		0.233 UJ		0.228 UJ			0.272 U	6.42 U	5.94 UJ	7.26 U	6.21 U	6.35 U	6.9 U	12.3 U	12.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane 1,1,2-Trichloroethane	µg/m³ ug/m³	31000 0:18	4400000 29	1000000 5.8	0.518 0.214 U	0.273 U	0.783 0.273 ਦ		0.511 J 0.185 UJ		0.533 J 0.181 UJ			0.507 0.216 U	7.17 U 5.11 U	6.63 UJ 4.72 UJ	8.11 U 5.77 U	6.94 U 4.94 U	7.09 U 5.05 U	15 U 5.5 U	13.7 U 9.77 U	13.6 U 9.71 U
1,1-Dichloroethane	μg/m ³	1.8	2600	58	0.159 U	0.202 U	0.202 U	0.147 U	0.138 UJ	0.145 U	0.134 UJ	0.156 U	0.142 UJ	0.161 U	3.79 U	3.5 UJ	5.23	3.66 U	3.75 U	4 U	7.25 U	7.2 U
1,1-Dichloroethene	μg/m³	210	29000	7000	0.156 U	0.198 U	0.198 U	0.186	0.135 ปม	0.142 U	0.131 UJ	0.156	0.198 J	0.157 ∪	3.71 ∪	3.43 UJ	4.19 U	3.59 ₺	3.67 ₺	4 U	7.1 ∪	7.06 ∪
1,2,4-Trichlorobenzene	µg/m³	2.1	290	70	0.291 U	15 U	15 U		0.252 UJ		0.246 UJ			0.294 U	6.94 U	6.42 UJ	7.85 U	6.72 U	6.87 U	15 U	13.3 U	13.2 U
1,2,4-Trimethylbenzene	μg/m³ ug/m³	7.3 0.0047	1000 6.8	240 0.16	0.22 0.302 U	0.26 0.384 U	0.246 U 0.384 U		0.274 J 0.261 UJ		0.163 UJ 0.255 UJ			0.195 U 0.305 U	25.2 7.19 U	4.25 UJ 6.64 UJ	5.2 U 8.13 U	4.45 U 6.96 U	49.4 7.11 U	4.9 U 7.7 U	8.8 U 13.8 U	8.75 U 13.7 U
1,2-Dibromoethane (EDB) 1,2-Dichlorobenzene	μg/m μg/m ³	210	29000	7000	0.302 U	0.301 U	0.301 U		0.201 UJ		0.255 U) 0.199 U)			0.239 U	5.63 U	5.2 UJ	6.36 U	5.44 U	5.57 U	6 U	10.8 U	10.7 U
1,2-Dichloroethane	µg/m³	0.11	160	3.6	0.159 €	0.25	0.202 U		0.138 UJ		0.134 UJ			0.161 U	3.79 ∪	3.5 UJ	38.7	41.6	3.75 U	4 U	7.25 ∪	7.2 ⊍
1,2-Dichloropropane	μg/m ³	0.28	410	9.4	0.181 U	0.231 U	0.231 U		0.157 ปร		0.153 UJ			0.183 U	4.32 U	4 UJ	147	747	4.28 U	4.6 U	8.27 U	8.23 U
1,2-Dichlorotetrafluoroethane	μg/m ³	NA	NA	NA	0.274 U	7 U	7 U		0.238 UJ		0.232 UJ			0.277 U	6.54 U	6.04 UJ	7.4 U	6.33 U	6.47 U	7 U	12.5 U	12.4 U
1,3,5-Trimethylbenzene 1,3-Dichlorobenzene	μg/m³ μg/m³	NA NA	NA NA	NA NA	0.193 U 0.236 U	4.9 U 0.301 U	4.9 U 0.301 U		0.167 UJ 0.204 UJ		0.163 UJ 0.199 UJ			0.195 U 0.239 U	8.3 5.63 U	4.25 UJ 5.2 UJ	5.2 U 6.36 U	4.45 U 5.44 U	18.1 5.57 U	4.9 U 6 U	8.8 U 10.8 U	8.75 U 10.7 U
1,3-Dichlorobenzene 1,4-Dichlorobenzene	μg/m³ μg/m³	NA 0.26	NA 370	NA 8,5	0.236 U	0.301 U	0.301 U		0.204 UJ		0.199 UJ			0.239 U	5.63 U	5.2 UI	6.36 U	5.44 U	5.57 U	6 U	10.8 U	10.7 U
1,4-Dioxane (p-Dioxane)	μg/m ³	0.56	820	19	3.54 U	3.6 U	3.6 U	3.26 U	3.06 UJ	3.23 U	2.99 UJ	3.48 U	3.17 UJ	3.57 U	3.37 U	3.12 UJ	3.81 U	3.26 U	3.34 U	3.6 ₺	6.45 U	6.41 U
2-Butanone	μg/m ³	5200	730000	170000	0.828	5.9 ∪	5.9 €		0.549 J		1.39 J			1.21	2.76 U	9.12 J	3.12 U	2.67 ป	2.73 U	5.9 U	9.99	11.2
2-Hexanone	μg/m ³	31	4400	1000	4.02 U	8.2 U	8.2 U		3.48 UJ		3.4 UJ			4.06 U	3.83 U	3.54 UJ	4.33 U	3.71 U	3.79 ∪	8.2 U	7.33 U	7.29 U
2-Methylnaphthalene 4-Methyl-2-pentanone	μg/m³ μg/m³	NA 3100	NA 440000	NA 100000	11.4 U 4.04	8.2 U	 8.2 U		9.88 UJ 2.68 J		9.64 UJ 2.86 J			11.5 U 2.48	5.44 U 3.83 U	5.03 UJ 3.54 UJ	6.15 U 4.33 U	5.26 U 3.71 U	5.38 U 3.79 U	8.2 U	10.4 U 7.33 U	10.4 U 7.29 U
Acetone	ug/m³	32000	4500000	1100000	14.4 J	19	20		10.3 J		15.71			13 J	23.4 NJ	38.9 NJ	6.38 NJ	9.16 NJ	7.2 NJ	6.7 B	52.4 NJ	52.7 NJ
Acrylonitrile	μg/m ³	0.041	60	1.4	2.13 UJ	0.236 J	0.109 UJ		1.84 UJ		1.8 UJ			2.15 UJ	2.03 U	1.88 UJ	2.3 U	1.96 U	2.01 U	4.3 U	3.89 ∪	3.86 ∪
Benzene	μg/m³	0.36	520	12	0.637	0.927	0.949	0.601	0.621 J	0.572 ป	0.66 J	0.618 U	0.562 UJ	0.634 U	5.62	2.86 NJ	3.38 U	2.89 U	9.94	3.2 U	5.72 U	5.69 U
Benzyl chloríde	µg/m³	0.057	83	1.9	0.203 U	5.2 U	5.2 U		0.176 UJ		0.172 UJ			0.205 U	4.84 U	4.48 UJ	5.48 U	4.69 U	4.79 U	5.2 €	9.27 ⊍	9.22 ∪
Bis (2-chloroisopropyl) ether Bromodichloromethane	μg/m ³	NA 0.076	NA 110	NA 2.5	6.87 U 0.263 U	0.335 8	0.335 U		5.94 UJ 0.228 UJ		5.8 UJ 0.222 UJ			6.94 U 0.266 U	6.55 U 6.27 U	6.05 UJ 5.79 UJ	7.4 U 7.09 U	6.33 U 6.07 U	6.48 U 6.2 U	 6.7 U	12.5 U 12 U	12.5 U 11.9 U
Bromoform	μg/m³ μg/m³	2.6	3700	2.5 85	2.03 U	10 U	10 U		1.76 UJ		1.71 UJ			2.05 U	9.67 U	8.94 UI	10.9 U	9.36 U	9.57 U	10 U	18.5 U	18.4 U
Bromomethane	μg/m ³	5.2	730	170	0.762 U	3.9 U	3.9 U		0.66 UJ		0.644 UJ			0.77 U	3.63 U	3.36 UJ	4.11 U	3.52 U	3.59 U	3.9 U	6.95 U	6.91 U
Carbon disulfide	μg/m³	730	100000	24000	0.122 ∪	3.1 U	3.1 U		0.106 UJ		0.103 UJ			0.124 U	2.91 U	2.69 UJ	3.29 U	2.82 U	2.88 U	3.2	5.57 €	5.54 U
Carbon tetrachloride	μg/m ³	0.47	680	16	2.47 U	0.922	0.726		2.14 UJ		2.09 UJ			2.5 U	5.89 U	5.44 UJ	15	5.7 U	5.82 U	6.3 U	11.3 U	11.2 U
Chlorobenzene Chloroethane	μg/m° μg/m³	52 10000	7300 1500000	1700 350000	0.181 U 0.104 U	4.6 U 0.223	4.6 U 0.132 U	0.167 U	0.156 UJ 0.0897 UJ	0.165 U	0.153 UJ 0.0875 UJ	0.178 U	0.162 UJ	0.183 U 0.105 U	4.31 U 2.47 U	3.98 UJ 2.28 UJ	4.87 U 2.79 U	4.17 U 2.39 U	4.26 U 2.44 U	4.6 U 2.6 U	8.24 U 4.72 U	8.19 U 4.7 U
Chloroform	ug/m ³	0.12	180	4.1	0.192 U	0.223	0.132 U 0.244 U	0.212 B	0.166 UI	0.175 U	0.162 UJ	0.189 U	0.172 UJ	0.194 U	4.57 U	4.22 UJ	96.8	4.42 U	4.52 U	4.9 U	4.72 U	4.7 U 8.69 U
Chloromethane	μg/m ³	94	13000	3100	2.03 U	2.1 U	2.1 U		1.75 UJ		1.71 UJ			2.05 U	1.93 U	1.79 UJ	2.18 U	1.87 U	1.91 U	2.1 U	3.7 U	4.83 NJ
cis-1,2-Dichloroethylene	μg/m³	NA	NA	NA	0.156 U	0.198 U	0.198 U		0.135 ปร		0.131 UJ			0.157 U	3.71 U	3.43 UJ	4.19 U	3.59 U	3.67 U	4 U	7.1 U	7.06 U
cis-1,3-Dichloropropene	µg/m³	NA	NA	NA	0.178 ∪	4.5 U	4.5 U		0.154 UJ		0.15 UJ			0.18 U	4.25 U	3.92 UJ	4.8 U	4.11 U	4.2 U	4.5 U	8.13 ∪	8.08 U
Dibromochloromethane Dichlorodifluoromethane	μg/m³ ug/m³	NA 100	NA 15000	NA 3500	0.334 U 2.42	8.5 U 3.95	8.5 U 3.52		0.289 UJ 2.4 J		0.282 UJ 2.47 J			0.338 U 2.41	7.97 U 4.63 U	7.36 UJ 4.28 UJ	9.01 U 5.23 U	7.71 U 4.48 U	7.88 U 4.58 U	8.5 U 4.9 U	15.2 U 8.85 U	15.2 U 8.8 U
Ethylbenzene	μg/m μg/m ³	100	15000	37	0.177	0.859	0.763		0.171 J		0.144 UJ			0.172 U	9.85	3.75 UJ	4.59 U	4.48 U 3.93 U	18.8	4.9 0	7.77 11	7.73 U
Hexachlorobutadiene	μg/m³	0.13	190	4.3	0.414 U	21 U	21 U		0.358 UI		0.35 UJ			0.418 U	9.87 U	9.12 UJ	11.2 U	9.55 U	9.76 U	21 U	18.9 U	18.8 U
m,p-Xylene	μg/m ³	100	15000	3500	0.579	1.95	1.8		0.552 J		0.434 J			0.446	49	7.51 UJ	9.14 U	7.86 U	99.8	12	15.5 ∪	15.5 U
Methylene chloride	μg/m ³	100	88000	3400	6.82 U	0.731	0.695 U		5.9 UI		5.76 UJ			6.89 U	3.25 U	3 UJ	3.68 U	3.14 U	3.22 U	3.5 U	6.22 U	6.18 U
n-Butylbenzene	μg/m ³	NA	NA 100000	NA 24000	0.216 U 0.882	5.5 U	5.5 U		0.186 UJ		0.182 UJ 0.993 J			0.218 U	5.14 U	4.75 UJ	5.81 U	4.97 U	5.08 U	5.5 U	9.83 U	9.77 U
n-Hexane n-Propylbenzene	μg/m³ μg/m³	1000	150000	24000 35000	0.882 0.193 U	3.5 U 4.9 U	3.5 U 4.9 U		1.01 J 0.167 UJ		0.993 J 0.163 UI			0.871 0.195 U	12.8 4.6 U	7.85 NJ 4.25 UJ	3.73 U 5.2 U	3.19 U 4.45 U	35.1 7.15	3.5 U 4.9 U	9.29 NJ 8.8 U	9.57 NJ 8.75 U
Naphthalene	μg/m ³	0.083	120	2.8	0.206 U	0.262 U	0.262 U		0.178 UJ		0.174 UJ			0.208 U	4.91 U	4.53 UJ	5.55 U	4.75 U	4.85 U	5.2 U	9.38 U	9.33 U
o-Xylene	μg/m ³	100	15000	3500	0.206	1.31	1.11		0.227 J		0.183 J			0.203	14.9	3.75 UJ	4.59 U	3.93 U	30.4	6	7.77 ⊍	7.73 ⊍
Styrene	μg/m ³	1000	150000	35000	0.167 U	0.213 U	0.213 U		0.145 UJ		0.141 UJ			0.169 U	3.99 U	3.68 UJ	4.51 U	3.86 U	3.94 U	4.3 U	7.63 U	7.58 U
tert-Butyl Methyl Ether	μg/m ³	11 11	16000 5800	360 360	0.142 ป 0.266 ป	0.687 J 0.353	0.18 UJ		0.122 UJ 0.23 UJ		0.12 UJ			0.143 U	3.37 U 6.35 U	3.12 UJ 5.86 UJ	3.81 U 7.17 U	3.26 U	3.34 U 6.28 U	3.6 U	6.45 U 12.1 U	6.42 U
Tetrachloroethene Toluene	μg/m³ μg/m³	11 5200	5800 730000	360 170000	0.266 U 1.92 J	0.353 2.35 J	0.339 U 2.37		0.23 UI 1.47 J		0.225 UJ 1.38 J			0.269 U 1.45	6.35 U 47.5	5.86 UJ 5.14 J	7.17 U 3.99 H	6.14 U 3.41 U	6.28 U 82.8	6.8 U 160	12.1 U	12.1 U 1.040
Trans=1,2-Dichloroethylene	µg/m ³	NA NA	NA NA	NA NA	0.156 U	0.198 U	0.198 U		0.135 UJ		0.131 UJ			0.157 U	3.71 U	3.43 UJ	4.19 U	3.59 U	3.67 U	4 U	7.1 U	7.06 U
trans=1,3=Dichloropropene	μg/m ³	NA NA	NA	NA.	0.178 ∪	4.5 U	4.5 U		0.154 UJ		0.15 UJ			0.18 U	4.25 U	3.92 UJ	4.8 U	4.11 U	4.2 ⊍	4.5 U	8.13 U	8.08 U
Tríchloroethylene	µg/m³	0.48	290	16	0.211 U	0.269 ∪	0.269 U		0.182 UJ		0.178 UJ			0.213 U	8.52	17.8 J	5.68 U	8.3	4.97 ∪	5.4 U	9.61 U	9.56 ∪
Trichlorofluoromethane	μg/m ³	NA	NA 29000	NA 7000	1.18 0.346 U	5.6 U	5.6 U	1.11	1.17 J 0.299 ₩	0.909	1.23 J	0.943	1.18 J	1.18 0.349 U	5.26 U	4.86 UJ 3.04 UJ	5.94 U 3.73 U	5.09 U 3.19 U	5.2 U	5.6 U	307	309
Vinyl acetate Vinyl chloride	μg/m³ μg/m³	210 0.17	29000 930	7000	0.346 U 0.1 U	3.5 U 0.128 U	3.5 U 0.128 U		0.299 UJ 0.0868 UJ		0.292 UJ 0.0848 UJ			0.349 U 0.101 U	3.29 U 2.39 U	3.04 UJ 2.21 UJ	3.73 U 2.7 U	3.19 U 2.31 U	3.26 U 2.37 U	3.5 U 2.6 U	6.3 U 4.58 U	6.27 U 4.55 U
VOCs, Total	μg/m ³	NA NA	NA NA	NA	28.007	35.398	32.021	2.109	21.935	0.909	27.833	1.099	1.378	23.757	205.09	81.67	309.11	806.06	358.69	192.5	1,438.68	1,427.30

Table 2-4. Faculty Housing Area Sampling Results

Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

Notes:
a: Screening levels are based on USEPA regional screening levels (RSLs; USEPA 2015b) for indoor air for a residential exposure scenario.
The RSLs are based on a 1E-06 (1 x 10 °) larget carcinogenic risk for current exposure scenarios and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).
b: Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03,
a 1E-06 (1 x 10-6) target carcinogenic risk for residential exposure, a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

B = The analyte was detected in the associated method and/or calibration blank.

J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

NA = Not available

NJ = The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

μg/m³ = Micrograms per Cubic Meter

Bold indicates the analyte was detected
Shading indicates the result exceeded Residential Indoor Air RSL
Blue colored results indicate concentration was detected above the Commercial/industrial Soil Gas VISL

Italicized results indicate concentration was detected above the Residential Soil Gas VISL

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Preliminary/Draft

Soil Gas COPC Summary Campus Assessment

Campus Location				T	Faculty Hou	sing		Fleming Hall	Quad	Dawnson Hall	JKS Hall		Student Union	
Client Sample ID				FR-AA1-012616*	VP-1	VP-3	VP-4	VP-5	VP-6	VP-7	VP-9	VP-10	VP-11	VP-13
Depth	Units	VISL Residential	VISL Commercial	0-0	8-10'	8-10'	8-10"	8-10'	8-10'	8-10"	8-10"	8-10'	8-10'	8-10'
Date Collected		Limit	Limit	1/26/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016		08/27/2016	08/27/201
Analyte				Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
ACETONE MANUFACTOR CONTROL	ug/m ³	1.00E+06	4.50E+06	21 J	167	196	328	169	115	199	295	236	73.7	49.9
BENZENE CONTRACTOR	ug/m³	12	520	0.601 J	19.4	54.7	78.4	33.1	24	30.3	57.5	55.3	18.8	13.1
CARBON DISULFIDE	na/m3	2.40E+04	1.00E+05	0.107 UJ	3.96	140	110	. 30.3	116	384	602	318	112	85.9
CHLOROBENZENE *** *****	μg/m ³	1700	7300	0.158 UJ	<0.924	< 0.924	<0.924	< 0.924	<0.924	<0.924	<0.924	<0.924	<0.924	1.5
CHLOROMETHANE	µg/m³	3100	1.30E+04	1.77 UJ	< 0.413	1.03	<0.413	<0.413	<0.413	<0.413	<0.413	1.15	<0.413	<0.413
CYCLOHEXANE	ua/m³	2.10E+05	8.80E+05	NS	<0.689	26.8	13.4	1.18	4.35	5.6	7.86	5.06	4.58	8.47
1,3-DICHLOROBENZENE	µg/m³	NE	NE	0.207 UJ	<1.2	2.26	4.51	3.46	6.98	6.54	7.48	3.1	2.95	2.43
1,1-DICHLOROETHENE	µg/m³	7000	2.90E+04	0.136 UJ	<0.793	0.959	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793
TRANS-1,2-DICHLOROETHENE	µg/m³	NE	NE	0.136 UJ	<0.793	3	1.9	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793
ETHANOL	ug/m³	NE	NE	NS NS	549	435	547	489	1440	1330	697	359	451	257
ETHYLBENZENE WOOD TO	ug/m³	37	1600	0.149 UJ	<0.867	4.48	3.24	<0.867	1.76	<0.867	1.1	<0.867	<0.867	1.17
4-ETHYLTOLUENE	ua/m³	NE	NE	NS	<0.982	2.44	2.04	1.5	3.12	1.88	2.35	1.59	1.02	1.92
TRICHLOROFLUOROMETHANE	μg/m ³	NE	NE	1.17 J	1.34	1.56	1.53	2.58	1.96	1.86	2.18	22	27.6	2.16
DICHLORODIFLUOROMETHANE		3500	1.50E+04	2.39 J	1.75	2.03	4.03	2.49	2.14	2.31	2.32	2.17	2.23	2.8
HEPTANE	ug/m³	NE	NE	NS	1.89	13.9	33.3	4,12	21.5	7.47	18.3	17.8	3.53	7.55
N-HEXANE	na/w ₃	2.40E+04	1.00E+05	NS	2.03	29.7	24.2	8.36	16.5	30.4	38.6	23.7	15.2	17.2
METHYLENE CHLORIDE	ug/m³	3400	8.80E+04	5.97 UJ	< 0.694	4.12	4.15	1.72	1.87	2.23	2.12	4.01	4.1	3
2-BUTANONE (MEK)	ug/m³	1.70E+05	7.30E+05	0.663 J	3.78	5.79	4.99	5.47	10.2	9.52	6.48	4.15	10.1	<3.69
NAPHTHALENE : 20 0 800	µg/m³	2.8	120	0.18 UJ	<3.3	12,4	20	8.09	10.2	10.9	15.2	10.6	<3.3	10.8
2-PROPANOL	ug/m³	7000	2.90E+04	NS NS	<3.07	8.16	8.33	3.69	11.1	4.66	<3.07	<3.07	<3.07	<3.07
PROPÈNE	µg/m³	1.00E+05	4.40E+05	NS	126	296	132	184	649	1210	1040	258	49.3	66.7
STYRENE	µg/m³	3.50E+04	1.50E+05	0.146 UJ	<0.851	1.67	2.29	<0.851	2.48	0.859	0.925	<0.851	<0.851	<0.851
TETRACHLOROETHENE	µa/m³	360	5800	0.233 UJ	<1.36	1.49	1.52	<1.36	2.39	<1.36	1.82	<1.36	<1.36	<1.36
TOLUENE	µg/m³	1.70E+05	7.30E+05	0.617 J	2.32	46.5	53.7	4.87	50.6	9.52	21.3	18.1	11.4	13.4
1,2,4-TRIMETHYLBENZENE	ug/m³	240	1000	0.169 UJ	<0.982	2.45	2.25	1.64	3.04	1.99	2.43	1.67	<0.982	1.95
1.3.5-TRIMETHYLBENZENE	µg/m³	NE NE	NE NE	NS	<0.982	<0.982	<0.982	<0.982	1.04	<0.982	<0.982	<0.982	<0.982	<0.982
2,2,4-TRIMETHYLPENTANE	ug/m³	NE NE	NE NE	NS	< 0.934	9.68	8.65	< 0.934	2.66	5.37	7.08	6.87	4.18	6.64
VINYL CHLORIDE	µg/m³	5.6	930	0.0879 UJ	<0.511	11.8	6.27	<0.511	<0.511	<0.511	<0.511	<0.511	<0.511	0.917
M&P-XYLENE	ug/m³	3500	1.50E+04	0.39 J	<1.73	15.3	10.2	2.05	5.4	2.05	3.35	2.18	<1,73	4.88
O-XYLENE	ug/m³	3500	1.50E+04	0.149 UJ	<0.867	5.97	4.75	0.925	2.32	<0.867	1.22	< 0.867	<0.867	2.54
pr - n a recent This	DUM	L	1.000	1		aliania de la como		dana and a second	and the same of th	Anna construction of the c	ocahomous anatomous ana	nel anno essentiato de marcones	allege construction and the second se	AMERICAN CONTRACTOR OF THE PERSON NAMED IN

indicates analyte included on DOW's RCRA analyte list indicates analyte exceeds Residential VISL screening limit

µg/m³ = micrograms per cubic meter



EnviroProbe Project #15-0137-004

^{*} Ambient air sample collected by DOW outside vacant faculty residence on 1/26/16

Rescreened Copies of CH2M Hill Groundwater Analytical Data Phases I through V

Table 1. Summary of Phase I Groundwater Data

Union Carbide Corporation, Institute Facility, Institute, West Virginia

				Shallo	ow Interval Results				
				Location>> Sample ID>> Depth (ft)>>	INS-0389 0389-GW01-031313 32 - 37		INS-0390 0390-GW01-031213 32 - 37		
			Section 1	Sample Date>>	3/13/2013		3/12/2013		
	a		RBSLs	Sample Dates	3/13/2013				
			Commercial/ Industrial	Residential					
Analyte ^a	Units	MCL / RSL	VISL	VISL		RL		RL	
SVOC 1,4-Dioxane (p-Dioxane)	μg/L	0.46	180000	4000	3,71J (SK?	1.09	7.081	1.11	
isophorone	μg/L	78	NA NA		5.43 U	5.43	5.56 U	5.56	
Naphthalene	μg/L	0.17	310	7.2	5.43 U	5.43	5.56 U	5.56	
/OC	l ro/								
,1-Dichloroethane	μg/L	2.8	430	9.9	1.88	1	2.67	1	
,1-Dichloroethene	μg/L	7	1000	240	1U	1	1.45	1	
L,2-Dichloroethane	μg/L	5	130	30	10	1	10	1	
cetone	μg/L	1400	120000000	29000000	5 U	5	5.0	5	
enzene	μg/L	5	92	2.1	1 U	$31_{(2)}$	(1.76)	1	1.
hlorobenzene	μg/L	100	2400	570	10	1	64.8	_1_	an <u>Consti</u> nction
Ihloroform	μg/L	80	46	1.1	10	1	(12.2	1	
Dichlorodifluoromethane	μg/L	20	41	9.9	10	1	10	1	
Ethylbenzene	μg/L	700	220	49	10	1	10 /	1	
letrachloroethene	μg/L	5	340	21	10	1	10	1	
oluene	µg/L	1000	110000	26000	1U	1	10	.1	
richlorofluoromethane	μg/L	520	NA	NA	3.64	1	26.5 \	1	

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Table 1. Summary of Phase I Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

Duplicate

					Deep Interval R	esults				
			INS-0385 0385-GW02-031513 37 - 42		INS-0387 0387-GW-051613 35 - 45		INS-0387 0387-GW-051613D 35 - 45		INS-0388 0388-GW-051713 33.5 - 43.5	
Analyte ^a	Units	MCL / RSL	3/15/2013	RL	5/16/2013	RL	5/16/2013	RL	5/17/2013	RL
SVOC										
1,4-Dioxane (p-Dioxane)	μg/L	0,46	⟨Ø\Q 11.6	10.5	A STATE OF THE PROPERTY OF THE				· · · · · · · · · · · · · · · · · · ·	
Isophorone	µg/L	78	5.26 U	5.26						
Naphthalene	μg/L	0.17	5.26 U	5.26						1 44 4
voc										
1,1-Dichloroethane	μg/L	2.8	√√√ 3.98	1	IU	1	1.0	1	1U	1
1,1-Dichloroethene	μg/L	7	10	1	10	1	10	1	1.U	1
1,2-Dichloroethane	μg/L	5	10	1	IU IU	1	10	1	1.0	1
Acetone	µg/L	1400	50	5	5 UL	5	5 UL	5	5 U	5
Benzene	μg/L	5	10	1	10	1	10	1	10	1
Chlorobenzene	µg/L	100	10	1	10	1	10	1	TAP 205 VIC	1
Chloroform	μg/L	80	TAP 24.6 NICH	1	10	1	10	1	TAP 2.25 / Vr.	1
Dichlorodifluoromethane	µg/L	20	2.09 17	1	1.00	1	1 UI	1	10	1
Ethylbenzene	μg/L	700	10	1	10	1	10	1	10	1
Tetrachloroethene	μg/L	5	10	1	10	1	10	1	10	1
Toluene	μg/L	1000	1 U	1	10	1	10	1	1.0	1
Trichlorofluoromethane	μg/L	520	52.1	1	10	1	10	1	3.11	1

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Table 1. Summary of Phase I Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Deep Interval F	esults				
Analyte*	Units	MCL/RSL	INS-0387 0387-GW02-031413 40 - 45 3/14/2013		INS-0387 0387-GW02-031413D 40 - 45 3/14/2013	R	INS-0388 0388-GW02-031413 42 - 47 3/14/2013	RL	INS-0389 0389-GW-051613 35-45 5/16/2013	
SVOC		1,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				<u> </u>	3/12/10/20			
1,4-Dioxane (p-Dioxane)	μg/L	0.46	1101	1.1	1.12 UJ	1.12	NDN 5.461	1.09		
Isophorone	μg/L	78	5.49 U	5.49	5.62 U	5.62	5,43 U	5.43	Sides ree	
Naphthalene	μg/L	0.17	5.49 U	5.49	5.62 U	5.62	5.43 U	5.43		
VOC										
1,1-Dichloroethane	μg/L	2.8	1.26	1	1.24	1	1.76	1	⟨⟨⟨⟩⟨⟩⟨⟩ 6.18	1
1,1-Dichloroethene	μg/L	7	10	1	10	1	1 U	1	1.03	1
1,2-Dichloroethane	µg/L	5	10	1	10	1	1 U	1	1 U	111
Acetone	μg/L	1400	5 UL	5	5 UL	- 5	50	5	5 Ü	5
Benzene	µg/L	5	10	1	10	1	(NY 4/5.3 V	1	10	1
Chlorobenzene	μg/L	100	10	1	10	1	10	1	1U ,	1
Chloroform	μg/L	80	(DR V 1.78 V	1	100 1.56 VV	1	17 29.9 VOC	1	192 29.6 V/C	1
Dichlorodifluoromethane	μg/L	20	10	1	10	1	10	1	KTOR 43 K VK	1
Ethylbenzene	μg/L	700	1 U	1	10	1	10	1	10	1
Tetrachloroethene	μg/L	5	10	1	1 U	1	10	1	10	1
Toluene	µg/L	1000	10	1	10	1	10	1	10	1
Trichlorofluoromethane	μg/L	520	2.29	1	2.05	1	49.5	1	141	1

Table 1. Summary of Phase I Groundwater Data

Union Corbide Corporation, Institute Facility, Institute, West Virginia

				eep In	iterval Results			
			INS-0389 0389-GW02-031313 42 - 47		INS-0390 0390-GW-051713 35 - 45		INS-0390 0390-GW02-031213 42 - 47	
Analyte ^a	Units	MCL / RSL	3/13/2013	RL.	5/17/2013	RL	3/12/2013	RL
SVOC	15 DVI							
1,4-Dioxane (p-Dioxane)	μg/L	0.46	√√√ 4.83 J	1.08	**		√√√√√ 36.7	10.3
Isophorone	μg/L	78	5.38 U	5.38			5.15 U	5.15
Naphthalene	μg/L	0.17	5.38 U	5.38			5.15 U	5.15
voc								
1,1-Dichloroethane	μg/L	2.8	ADR 12.3 156	1	∧ ♥ 2.96	1	1.51	1
1,1-Dichloroethene	μg/L	7	1.15	1	1.4	. 1	1.0	1
1,2-Dichloroethane	µg/L	5	10	1	10	1	1 U	1
Acetone	µg/L	1400	su .	5	50	5	5 U	5
Benzene	μg/L	5	1 U	1	((1.67 W	1	10	1
Chlorobenzene	μg/L	100	10	1	X (N) 37.7 V(C)	1	1 U	1
Chloroform	μg/L	80	NX 13.84 CL	1	100 13 MG	1	10	1
Dichlorodifluoromethane	µg/L	20	MAR 57.24/6	1	10	1	1 W	1
Ethylbenzene	µg/L	700	1.0	1	10	1	10	1
Tetrachloroethene	μg/L	5	10	1	10	1	10	1
Toluene	μg/L	1000	10	1	10	1	10	1
Trichlorofluoromethane	μg/L	520	25.6 L	1	30.5	1	10	1

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and

1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

<u>Underlined results indicate shallow concentrations detected above the Residential VISL</u> (no concentrations are greater than commercial/industrial VISLs). Grey shaded result indicates concentration detected above the MCL/RSL.

μg/L = micrograms per liter

NA = Not applicable

I flag indicates the reported concentration is estimated.

K flag indicates the reported concentration is biased high.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

U flag indicates the constituent was not detected above the reporting detection limit (RL).

UJ flag indicates the constituent was not detected above an estimated reporting detection limit.

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Table 2. Summary of Phase II Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

							hallow	Interv	al Results	E 1450				ë e L
			Sa RBSLs	Location>> Sample ID>> Depth (ft)>> ample Date>>	0465	INS-0465 -GW01-102714 23 - 27 0/27/2014			INS-0466 6-GW01-102814 22 - 26 10/28/2014		INS-0467 0467-GW01-102114 32 - 36 10/21/2014		INS-0468 0468-GW01-102414 32 - 36 10/24/2014	
Analyte [*] U	Inits	MCL / RSL	Commercial/I ndustrial VISL	Residential VISL			RL			RL		RL		RL
SVOC	alasia situata		ArpO.	3/165										
1,4-Dioxane (p-Dioxane) <u> </u>	ag/L	0.46	180000	4000	1616	4.64	1.15	130	1.05 U	1.05	⟨⟨♥⟨₹ 5.05	1.08	√ ₩ 2.52	1.11
Isophorone μ	ıg/L	78 🖊	NA,/	NA		5.75 U	5.75		5.26 U	5.26	גע 5.38	5.38	2.78 U	5.56
Naphthalene μ	ig/L	0.17	<u>,</u> ,}>310-4,‰	7.2 りし	<u> </u>	5.75 U	5.75		5.26 U	5,26	5.38 UJ	5.38	2.78 U	5.56
VOC	enter establishment of the second				Liver processors		an aniedio Pari i sus on	interes hande	Manufacture and reference to the control of the con	No 1.00 - 1001 (1007)		Security of the National Control of the Control of		SSS NON-CONSTRUCT
1,1-Dichloroethane μ	ig/L	2.8	32 430 64			1 U	1		10	1	€ 6.44	1	0.125 U	1 1
1,1-Dichloroethene µ	Ig/L	497	76 1000 BY	240,20		10	1		10	1	2.73	1	0.5 U	1
1,2-Dichloroethane µ	ıg/L	50.17	A 6 130 K	30 7.7		10	1		10	1	1.0	1	0.25 U	1
Acetone µ	ug/L	1400	1,200000000	29 00000 0		5 01	- 5		S UJ	5	50	5	2.5 UI	5
Benzene µ	ıg/L	5U W	/ 92 (p. ⁽⁴)	2.1\\\\\)		10	1		10	1	10	1	0.125 U	1
Chlorobenzene μ	ıg/L	100 7,8	2400 (70)	570W/		10	1		10	1	10	1	0.125 U	J.
Chloroform µ	ig/L	800, L l	46 30	1.10 3		10	1		10	1	1.07	1	0.125 U	1
	ig/L	20 /	41 3 1	9.9()]-		1.01	1		1 UJ	1	101	1	0.25 UJ	1
Ethylbenzene μ	ig/L	700 \ 0	220 🟒	493,5		1.0	1		10	1	10	1	0.25 U	1
Tetrachloroethene µ	ıg/L	5 U, 1	340 JA	21-7-6		10	1		10	1	10	1	0.25 U	1
	ıg/L	1000 VIV		O 260 0 0"		10	1		10	1	10	1	0.25 U	1
Trichloroffuoromethane μ	ig/L	520 (15 2		NA 1912		10	1		10	1	10	1	0.25 U	1

Table 2. Summary of Phase II Groundwater Data

Union Carbide Corporation, Institute Facility, Institute, West Virginia

	T T					Deep	Interval Results					
Analyte [®]	s Units	Location>> Sample ID>> Depth (ft)>> ample Date>> MCL / RSL	0465-GW02-102714 44 - 47	RL	INS-0466 0466-GW02-102814 42 - 46 10/27/2014	n.	INS-0466 0466-GW02-102814D 42 - 46 10/28/2014	R	INS-0467 0467-GW02-102114 42 - 46 10/21/2014	RL	INS-0468 0468-GW02-102414 41 - 45 10/24/2014	R
svoc												
1,4-Dioxane (p-Dioxane)	µg/L	U.46	14.7	11.17	7.02	1.08	₹\$ 5,58	1.12	₹ 22.2 K	10.8	ACM 3.61	1.27
Isophorone	µg/L	78	5.56 U	5.56	5.38 U	5.38	5.62 U	5.62	5.38 UJ	5.38	3.16 UL	6.33
Naphthalene	μg/L	0.17	5.56 U	5.56	5.38 U	5.38	5.62 U	5.62	5.38 UJ	5.38	3.16 UL	6.33
voc												
1,1-Dichloroethane	µg/L	2.8	1 U	1	10	1	10	1	1 U	1	0.125 U	1
1,1-Dichloroethene	ug/L	7	10	1	10	1	1.0	1	10	1	0,5 U	1
1,2-Dichloroethane	μg/L	5	10	1	1U	1	10	- 1	111	1	0.25 U	1
Acetone	μg/L	1400	SUI	5	5 UI	5	5 W	- 5	5 U	5	2.5 UJ	5.
Benzene	μg/L	5	10	1	10	-1	10	1	10	1	0.125 U	1
Chlorobenzene	μg/L	100	10	1.	10	1	10	1	10	1	0.125 U	1
Chloroform	µg/L	80	10	1	110	1	10	1	1.0	1	0.125 U	1
Dichlorodifluoromethane	µg/L	20	100	1	100	1	100	1	1.01	1	0.25 UJ	(1)
Ethylbenzene	μg/L	700	10	1	10	1	10	1	10	1	0.25 U	1
Tetrachloroethene	µg/L	5	10	1	10	1	10	1	1.0	1	0.25 U	1
Toluene	μg/L	1000	10	1	10	1	10	1	10	1	0.25 U	1
Trichlorofluoromethane	μg/L	520	10	1	10	1	10	1	10	1	0.25 U	1

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

No shallow interval concentrations are greater than the residential or commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

ug/L = micrograms per liter

NA = Not applicable

U flag indicates the constituent was not detected above the reporting detection limit (RL).

UI flag indicates the constituent was not detected above an estimated reporting detection limit.

K flag indicates the reported concentration is biased high.

UL flag indicates analyte was analyzed for but was not detected. The quantitation limit may be biased low.

Table 3. Summary of Phase III Groundwater Data

Institute Eastern Property Boundary Investigation - Phase II through Phase V Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Shallow Interval Resi	ults	2010-201-201-001-001-001-001-001-001-001			
				Location>>	INS-0469		INS-0469		INS-0470	
		RBSLs Commercial /Industrial	Residential	Sample ID>> Dopth (ft)>> Sample Date>>	0469-GW01-021015 33 37 2/10/2015		0469-GW01-021015S 33 - 37 2/10/2015		0470-GW01-021115 18 - 22 2/11/2015	
Analyte ^a	Units	MCL/RSL VISL	VISL			RL		RL		RL
SVOC 1,4-Dioxane (p-Dioxane)	μg/L	13000 0.46 × 180000	29(C) 4000		/DK 3.46	1.19	√જુ√ 23	0.11	√Ç√V 5.19	1.33
					Shallow Interval Resi	ılts				
				Location>>	INS-0470	T .	INS-0471	- Complete on the Complete of the Complete on	INS-0471	
		RBSLs Commercial /Industrial Re		Sample ID>>	0470-GW01-021115S		0471-GW01-021215		0471-GW01-021215D	
				Depth (ft)>> Sample Date>>	18 - 22 2/11/2015		34 - 38 2/12/2015		34 - 38 2/12/2015	
Analyte ^a	Units	MCL / RSL VISL	VISL	<u> </u>		RL		RL		RL
SVOC 1,4-Dioxane (p-Dioxane)	μg/L	0.46 × 180000	6/4/CD 4000		ACO 42	0.5	∕ € € 5.13	1.06	/KP 5.41	1.06
								1.1		
				Shallow Inte						
		RBSLs		Location>> Sample ID>>	INS-0471 0471-GW01-021215DS		INS-0471 0471-GW01-0212155			
		Commercial /Industrial	Residential	Depth (ft)>> Sample Date>>	34 - 38 2/12/2015		34 - 38 2/12/2015			
Analyte ^a	Units	MCL/RSL VISL	VISL			RL		RL		
SVOC 1,4-Dioxane (p-Dioxane)	μg/L	0.46 V 180000	2/00 1 4000		£ 44	0.11	A 44	0.12		

Table 3. Summary of Phase III Groundwater Data

Union Carbide Corporation, Institute Facility, Institute, West Virginia

Section Sectio							
Deep Interval Results	Location>>	INS-0470		INS-0470		INS-0471	1
	Sample ID>>	0470-GW02-021115		0470-GW02-021115S		0471-GW02-0212155	
	Depth (ft)>>	46 - 50		46 - 50		44 - 48	
	Sample Date>>	2/11/2015		2/11/2015		2/12/2015	
Analyte ^a	Units MCL / RSL		RL		RL		RL
SVOC							
1,4-Dioxane (p-Dioxane)	µg/L 0.46	△○○○ 3.48	1.08	√/p/C 5:3	0.11	√04/ 3.3	0.11

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL, November 2015) for tap water based on a target carcinogenic risk = 1E-06

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06

for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the residential or commercial/industrial VISL

Grey shaded results indicate concentration detected above the MCL/RSL.

μg/L = micrograms per liter

Table 5. Summary of Phase V Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

						Shallow Interval	Resu	lts				w.	
			Location>> Sample ID>> Depth (ft)>> Sample Date>>	INS-0555 0555-GW01-012116 22-26 1/21/2016		INS-0559 0559-GW01-011916 21-25 1/19/2016		INS-0563 0563-GW01-011916 22-26 1/19/2016		INS-0566 0566-GW01-011916 18-22 1/19/2016		INS-0570 0570-GW01-011916 18-22 1/19/2016	
Analyte*	Units	R Comme MCL / /Indus RSL VIS	trial Residential		WL		RL.		RL		RL		RL
SVOC													
1,4-Dioxane (p-Dioxane)	µg/L	0.46 / 1800	00 4000	0.20 U	0.21	₹ 0.49	0.2	₹ ₹₹ 7.7	0.2	R 3.4	0.2	0.20 U	0.2
Isophorone	μg/L	78 √ NA	NA NA	10	1	10	1	10	1	10	1	10	1
Naphthalene	μg/L	0.17 🗸 310	7.2 الق	0.5 U	0.5	0.5 U	0.5	0.5 0	0.5	0.5 U	0.5	0.5 U	0.5
VOC					Commissionis								
1,1-Dichloroethane	μg/L		14/ و.و الاركز	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	05 U	0.5	0.5 U	0.5
1,1-Dichloroethene	μg/L	7.24 100	0-04 240 22	0.511	0.5	050	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	50 1 130)¢3€(30 ½°	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400 - 120000		5.U	5	5 U	5	5 U	5	5 U	5	0.5 U	- 5
Benzene	µg/L	50-10 92	WM 2.1\U	0.5 U	0.5	050	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	μg/L	100 76 240	0 17 570 W	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	800 12- 16	4. J 1.10 8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20 / //1	3, \ \ 9.9 O \	↑ 0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	μg/L	700 1 220		J0.54L	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5 - 340	21 XX	JC & 30 M2	0.5	05.0	0.5	0.50	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	µg/L	12000		0.50	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520 NA		0.5.0	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

Table 5. Summary of Phase V Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V
Union Carbide Corporation, Institute Facility, Institute, West Virginia

					Deep Interval	Result	\$			
		Location>> Sample ID>> Depth (ft)>> nple Date>>	INS-0553 0553-GW02-011816 51-55 1/18/2016		INS-0554 0554-GW02-011816 51-55 1/18/2016		(NS-0555 0555-GW02-012116 47-51 1/21/2016		INS-0555 0555-GW02-0121(60') 47-51 1/21/2016	
Analyte ³	Units	MCL / RSL		RL.		RL		RL		RL
SVOC	granica de la companya de la company									a an internal
1,4-Dioxane (p-Dioxane)	μg/L	0.46	0.24	0.21	0.22 U	0.21	W 0.48	0.21	155 0.47	0.21
Isophorone	µg/L	78	10	1	1 U	1	, R	1	The state of the s	1
Naphthalene	µg/L	0.17	0.5 U	0.5	0.5 U	0.5	0.S.U	0.5	0.5 U	0.5
VOC										
1,1-Dichloroethane	μg/L	2.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1-Dichloroethene	µg/L	7	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	µg/t	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	μg/L	1400	50	5	22	5	5 U	5	5 U	5
Benzene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0,5
Chlorobenzene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloroform	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	μg/L	20	0.5 U	0.5	050	0.5	0.5 U	0.5	0.5 U	0.5
Ethylbenzene	µg/L	700	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Toluene	μg/t	1000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	µg/L	520	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5

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INCONSEQUENTIAL - NOT
WORTH MENTIONING AS
A DATA GAR

Table 5. Summary of Phase V Groundwater Data
Institute Eastern Property Boundary Investigation - Phase II through Phase V

						eep Ir	iterval Results					
		Location>> Sample ID>> Depth (ft)>> nple Date>>	INS-0573 0573-GW01-012116 46-50 1/21/2016		INS-0574 0574-GW01-012116 47-51 1/21/2016		TW-105 TW105-GW-011416 48-58 1/14/2016		TW-105 TW105-GW-0114160 48-58 1/14/2016		TW-106 TW106-GW-011416 48-58 1/14/2016	
Analyte ^a	Units	MCL / RSL		RL		RL		RL		RL		RI
SVOC												
1,4-Dioxane (p-Dioxane)	μg/L	0.46	TH 0.57		1902 25		0.21 U	0.21	0.20	0.2	13	0.2
Isophorone	µg/L	78	10		10		10	1	10	1	10	1
Naphthalene	µg/L	0.17	0.5 U		0.5 U		0.5 U	0,5	0.5 U	0.5	0.5 U	0.5
voc						CONTRACTOR OF THE PARTY OF THE						
1,1-Dichloroethane	µg/L	2.8	0.5 U	and control of the same	0.5 U	alomostic se	0.5 U	0.5	0.5 U	0.5	050	0.5
1,1-Dichloroethene	µg/L	7	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloroethane	μg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Acetone	µg/t	1400	5.0 U		5.00		5.0	5	5.0	5	5 U	5
Benzene	μg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chlorobenzene	ug/L	100	0.5 U		0.5 U		0.5 U	0.5	0.5 U	0.5	0.5 Ü	0.5
Chloroform	µg/L	80	050		0.5 U		0.5 U	0.5	0,5 U	0.5	0.5 U	0.5
Dichlorodifluoromethane	µg/L	20	0.5.U		0.5 U		0.50	0.5	0.5 U	0.5	WW 171 WW	0.5
Ethylbenzene	µg/L	700	0.5 U		0.5 U		05U	0.5	0.5 U	0.5	0.5 U	0.5
Tetrachloroethene	μg/L	5	0.5 U		0.5 U		0.5 U	0.5	0.50	0.5	0.5 U	0.5
Toluene	μg/L	1000	0.5 U		0.50		0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichlorofluoromethane	μg/L	520	0.5 U		0.5 0		050	0.5	0.5 U	0.5	0.5 U	0.5

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water based on a target carcinogenic risk = 1E-06 and an adjusted non-cancer hazard quotient of 0.1; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06 for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to shallow interval results.

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL.

Underlined results indicate shallow concentrations detected above the Residential VISL.

μg/L = micrograms per liter

NA = Not applicable

R flag indicates the data were not of sufficient quality for reporting.

U flag indicates the constituent was not detected above the reporting detection limit.

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Table 6. Summary of Additional Analyses - Phase V

Institute Eastern Property Boundary Investigation - Phase II through Phase V Union Carbide Corporation, Institute Facility, Institute, West Virginia

Union Corbide Corporation, In	Timble 10	umy, mam	7	(mus	Si	hallow	Interval Results	-						
				Location>> Sample ID>> Depth (ft)>> mple Date>>	INS-0555 .0555-GW01-012116 .22-26 .1/21/2016		INS-0559 0559-6W01-011916 21-25 1/19/2016		INS-0563 0563-GW01-011916 22-26 1/19/2016		INS-0566 0566-GW01-011916 18-22 1/19/2016		IN5-0570 05/0-GW01-011916 18-22 1/19/2016	
Analyte*	Units	MCL/RSL	Commercial/ Industrial VISL	Residential VISL		RL		RL.		RL		RL.		RL.
VOC	T												Sala V	
1,1,2,2-Tetrachlorgethane	pg/L	0.076	2000	4.6	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	μg/t	5	36.2 ∪	7.2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	ug/L	15	180 \ 1	43	0.5 U	0.5	0.50	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2-Dichloropropane	μg/L	5	140 \\	3.3	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5.0	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	μg/L	120	NA /	NA	0.5 U	0.5	0.5 0	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5
1,3-Dichlorobenzene	ug/L	NA	NA 🗸	NA	0.5.0	0.5	0.50	0.5	0.5 0	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	ug/L	75	/ 170 · W	3.8	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	13000000	3000000	50	5	S U	5	5.0	5	50	5	50	5
2-Hexanone	ug/L	38 3	1049000	12000	50	5	50	5	50	5	50	5	50	5
4-Methyl-2-pentanone	ug/L	6300	3300000	780000	50	5	5.0	5	5 U	5	5 U	5	5 U	5
Bromodichloromethane	μg/L	80	51 % 8	1.2	0.5 U	0.5	0.50	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
8romomethane	ug/L	7.5	89 7, 3	21	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	HB/L	810	6600 SU		10	1	10	1	10	1	10	1	10	1
Carbon tetrachloride	µg/L	5	24 1.8	0.54	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	ug/L	190	1300 V(C	310	0.5 U	0.5	0.5 U	0.5	0.5.0	0.5	0.5.0	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	ug/L	70	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	μg/L	80	18	NA	0.5 U	0.5	0.50	0.5	0.5 0	0.5	0.5 U	0.5	0.50	0,5
Methylene chloride	µg/L	5	25000	970	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5
Styrene	µg/L	100	56000	13000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	µg/L	100 ,	NA .	مر NA	, 0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	ug/L	36.V	×97.24	560°	100 23VCC	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5
Vinyl chloride	µg/L	2	29	0.24	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5
Xylenes, Total	ug/L	10000	2300	550	0.5 U	0.5	0.50	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
svoc				animana kini kalikala katan katan matan katan (₁₉₈₄										
2,4,5-Trichlorophenol	µg/L	1200	NA	NA	10	1	1.0	1	1 U	1	R R	1	10	
2,4,6-Trichlorophenal	µg/L	4,1	NA	NA	10	1	10	1	10	1	R	1	10	1
2,4-Dichlorophenol	ug/t	46	NA	NA	10	1	10	< 1	10	1	8	1	10	3
2,4-Dimethylphenol	μg/L	360	NA	NA	10	1	10	1	10	1	n	1	10	1
2,4-Dinitrophenol	µg/L	39	NA	NA	31 UI	31	30 U	30	30 U	30	- 10	30	30 U	30
2,4 Dinitrotoluene	μg/L	0.24	NA	NA	5 U	5	5 U	5	5 U	5	SU	5	5 U	5
2,6-Dinitrataluene	ug/L	0.049	NA	NA	10	1	10	1	10	1	10	1	10	1
2-Chloronaphthalene	µg/L	750	NA	NA	10	1	10	1	10	1	10	1	10	1
2-Chlorophenal	ug/L	91	NA	NA	10	1	10	1	10	3	, a	1	10	1
2-Methylnaphthalene	µg/L	36	NA	NA	0.5.0	0.5	0.052 U	0.052	0.052 U	0.052	0.051/0	0.051	0.052 U	0.052

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Table 6. Summary of Additional Analyses - Phase V Institute Eastern Property Boundary Investigation - Phase II through Phase V Union Carbide Corporation, Institute Facility, Institute, West Virginia

					· · · · · · · · · · · · · · · · · · ·	hallow	Interval Results	Contraction (1)						
				Location>> Sample ID>> Depth (ft)>> ample Date>>	INS-0555 0555 GW01-012116 22-26 1/21/2016		INS-0559 0559-GW01-011916 21-25 1/19/2016		INS-0563 0563-6W01-011916 22-26 1/19/2016		IN5-0566 0566-GW01-011916 18-22 1/19/2016		MS-0570 0570-GW01-011916 18-22 1/19/2016	
			RBSLs											
Analyte*			Commercial/ Industrial	Residential										
SVOC (continued)	Units	MCL / RSL	VISL	VISL		RL		RL		RL		RL		BL
2-Methylphenol	µe/L	930	NA.	NA	1U	1	10	1		دند دیدند 1	l n'	**************************************		1
2-Metriyiphenor 2-Nitroaniline	HE/L	190	NA NA	NA.	10	1	10	1	10	i		l i	10	1
2-Mitrophenol	µg/L	NA NA	NA NA	NA NA	10	1	10	lî	10	î	'n	1	10	1
3.3'-Dichlorobenzidine	ug/L	0.13	NA.	NA.	5 U	5	SU	5	S U	5	ŠÜ	5	5 Ú	5
3-Nitroaniline	µg/L	NA NA	NA NA	NA NA		1	10	1	10	î	111	1	iU	i
4,6-Dinitro-2-methylphenol	ug/L	1.5	NA NA	NA NA	15 W	15	15 U	15	150	15		15	150	15
4-Bromophenyl phenyl ether	ug/L	NA NA	NA NA	NA I	10	1.3	10	1	10	1	i'u	1	10	1
4-Chloro-3-methylphenol	ug/L	1400	NA NA	NA.	10	1	10	1	10	1		1	iu	i
4-Chloroaniline	ug/L	0.37	NA.	NA NA	40	4	au	1 4	40	à	10	4	411	ā
4-Chlorophenyl phenyl ether	ug/L	NA NA	NA NA	NA.	10		10		10	,	10		10	1
4-Nitroaniline	ug/L	3.8	NA.	NA .	iŭ	1	10		10	1	ίũ	l i	1U	
4-Nitrophenol	HE/L	42	0.0000011	NA.	31 0	31	30 U	30	300	30		30	30 U	30
Acenaphthene	µg/L	530	NA.	NA	0.5 U	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5	0.50	0.5
Acenaphthylene	ug/L	NA NA	NA.	NA	05 U	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5	050	0.5
Anthracene	µg/L	1800	NA NA	NA NA	05U	0.5	osu	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5
Benzo (a) anthracene	µg/L	0.012	NA.	NA.	050	0.5	0.052 U	0.052	0.052 U	0.052	0.051 U	0.052	0.052 U	0.052
Benzo (a) pyrene	µg/L	0.2	NA.	NA NA	0.5 U	0.5	0.052 U	0.5	0.052 U	0.5	0.051 U	0.5	0.052 U	0.5
Benzo (b) fluoranthene	ug/L	0.034	NA.	NA.	0.5 U	0.5	0.052 U	0.5	0.052 U	0.5	0.051 U	0.5	0.052.0	0.5
Benzo (g,h,i) perylene	μg/L	NA NA	NA.	NA NA	050	0.5	0.5 U	0.5	05 U	0.5	0.5 U	0.5	0.5 U	0.5
Benzo(k)fluoranthene	µg/L	0.34	NA.	NA NA	0.5 U	0.5	osu	0.5	050	0.5	05U	0.5	050	0.5
Bis (2-chloroethoxy) methane	µg/L	59	NA.	NA .	10	1	10	l ĭ	10	1	10	1	10	1
Bis (2-chloroethyl) ether	ug/t	0.014	850	20	0.052.0	0.052	0.051 U	0.051	0.051 U	0.051	0.05 U	0.051	0.051 UI	0.051
Bis (2-chloroisopropyl) ether	µg/L	710	610	NA	10	1	10		10	1	10	1	10	1
Bis (2-ethylhexyl) phthalate	μg/L	6	NA .	NA	5 U	5	5 U	ŝ	5 U	5	5 U	5	5 U	5
Butyl benzylphthalate	µg/L	16	NA.	NA	5.0	6	SU	5	50	5	SU SU	5	5 U	5
Chrysene	μg/L	3.4	NA	NA	050	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5	0.5 U	0.5
Di-n-butylphthalate	µg/L	900	NA.	NA NA	50	5	SU	s	5 U	5	SU	s	5 U	5
Di n-octylphthalate	ug/L	200	NA .	NA.	50	5	su	5	50	5	SU	Š	50	5
Dibenzo (a,h) anthracene	μg/L	0.0034	NA .	NA	0.5 U	0.5	050	0.5	0.50	0.5.	0.5 U	0.5	0.5 U	0.5
Dibenzoturan	µg/L	7.9	NA.	NA .		1	10	1	iu	1	l ïú	l ĭ	iu	1
Diethyl phthalate	µg/L	15000	NA	NA NA	SU	5	50	5	5 U	5	5 U	5	SU	5
Dimethyl phthalate	μg/L	NA	NA ,	NA ,	SÜ	5	SU	5	5 U	5	su	Ś	SU	5
Ethyl ether	μg/L	3906	NA Z	NAV/	0.50	0.5	3К	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Fluoranthene	μg/L	800	ÑΑ	NA	0.5 U	0.5	050	0.5	050	0.5	0.5 U	0.5	0.5 U	0.5

Table 6. Summary of Additional Analyses - Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

Union Carbide Carporation, ii	1				SI	nallow	Interval Results							
			Si RBSLs	Location>> Sample ID>> Depth (ft)>> Imple Date>>	INS-0555 0555-GW01-012116 22-26 1/21/2016		INS-0559 0559-GW01-011916 21-25 1/19/2016		INS-0563 0563-GW01-011916 22-26 1/19/2016		INS-0566 0566-GW01-011916 18-22 1/19/2016		INS-0570 0570 GW01-011916 18-22 1/19/2016	
Analyte*	Units	MCL / RSL	Commercial/ Industrial VISL	Residential VISL		RL		RL		RL		RI.		RL
SVOC (continued)	er kanagonisos milion	So. Jikmalanan sahiri san					and the second s			an unanamenta	#mousesticosministrations and training to promotive	The second Colonics of		
Fluorene	μg/L	290	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Hexachlorobenzene	μg/L	1	0.65	0.15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0,5 U	0.5
Hexachlorobutadiene	μg/L	0.14	21	0.47	10	1	10	1	10	1	10	1	10	1
Hexachlorocyclopentadiene	μg/L	50	5.2	1.2	15 0	15	15 U	15	15 U	15	15 U	15	15 U	15
Hexachloroethane	μg/L	0.33	110	2.6	5 U	5	SU	- 5	50	5	50	5	5 U	5
indeno (1,2,3-c,d) pyrene	μg/L	0.034	NA	NA .	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
n-Nitrosodi-n-propylamine	µg/L	0.011	NA	NA .	10	1	10	1	10	1	10	1	10	3
n-Nitrosodiphenylamine	μg/L	12	NA	NA .	10	1	10	1	10	1	10	1	10	1.
Nitrobenzene	µg/L	0.14	5000	110	10	1	10	1	10	1	1以	1	10	1
p-Cresol	µg/L	1900	NA .	NA NA	10	1	1.0	1	10	1	/R^	1	1.0	1
Pentachlorophenol	µg/L	1	NA	NA	50	- 5	50	5	50	5	\ B /	5	50	5
Phenanthrene	µg/L	NA	NA	NA	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0 <u>5</u> U	0.5	050	0.5
Phenol	µg/L	5800	NA	NA	10	1	10	1	1.0	1	(R)	1	10	1
Pyrene	μg/L	120	NA	NA	0.5 U	0.5	0.052 U	0.052	0 052 U	0.052	0,051/U	0.051	0.052 U	0.052
Metal		100 00S	9			- Control Companies and Co								
Arsenic, dissolved	mg/L	0.54	NA NA	NA	(* * * * * * * * * * * * * * * * * * *		⟨⟨√ ⟨ 0.0643	0.02	A 0.131	0.02	0.02 U	0.02	0.02 U	0.02
Barium, dissolved	mg/L	8.5%	NA .	NA	30%		∕ (χΩ0.562	0.005		0.005	⋌ Ŵ1.58	0.005	∜ 0.0901	0.005
Cadmium, dissolved	mg/L	0.005	NA	NA			0.005 U	0.005	0.005 U	0.005	0.005 U	0.005	0.005 U	0.005
Chromium, dissolved	mg/L	0.1	NA	NA .	1868-5		0.015 U	0.015	0.015 U	0.015	0.015 U	0.015	0.015 U	0.015
Lead, dissolved	mg/L	0.015	NA	NA .	3944		0.015 U	0,015	0.015 U	0.015	0.015 U	0.015	0.015 U	0.015
Mercury, dissolved	mg/L	0.002	0.0061	0.0015	3## D		0.0002 U	2E-04	0.0002 U	2E-04	0.0002 U	2E-04	0.0002 U	2E-04
Selenium, dissolved	mg/L	0.05	NA	NA	:36-64-7	3.5	0.02 U	0,02	0.02 U	0.02	0.02 U	0.02	0.02 U	0.02
Silver, dissolved	mg/L	0.094	NA	NA .			0.005 U	0.005	0.005 U	0.005	0.005 U	0.005	0.005 U	0.005

δÉ

0.350

.00, 620.

Assemic 0.05245/L

Barryon 380 USIL

380 ms/L

Page 3 of 6

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Table 6. Summary of Additional Analyses - Phase V Institute Eastern Property Boundary Investigation - Phase II through Phase V Union Corbide Corporation, Institute Facility, Institute, West Virginia

					Deep Interval F	Results				
	Salas Securitarios	Location>> Sample ID>> Depth (ft)>> ample Date>>	INS-0553 0553-GW02-011816 51-55 1/18/2016		INS-0554 0554-6W02-011816 51-55 1/18/2016		INS-0555 0555-GW02-012116 47-51 1/21/2016		INS-0555 0555-6W02-0121160 47-51 1/21/2016	
				l						
Analyte*	Units	MCL/RSL		RL		RL		RL		RL
voč	1		***************************************	1				1		1
1,1,2,2-Tetrachloroethane	μg/L	0.076	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethy/benzene	µg/L	15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,7-Dichloropropane	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.50	0.5	0.5 U	0.5
1.3.5-Trimethylbenzene	µg/L	120	0.5 U	0.5	0.5 U	0.5	0.5.0	0.5	0.5 U	0.5
1,3 Dichlorobenzene	μg/t	NA.	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,4-Dichlorobenzene	ug/L	75	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	50	5	5.5	5	5 U	5	5.0	5
2-Hexanone	µg/L	38	50	5	5 U	5	5 U	5	S Ü	5
4-Methyl-2-pentanone	μg/L	6300	5 U	5	5.0	5	SU .	5	50	5
Bromodichloromethane	µg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Bromomethane	µg/L	7.5	0.5 บ	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	µg/t	810	1.0	1	10		1.0	1	10	1
Carbon tetrachloride	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Chloromethane	µg/L	190	0.5 U	0.5	0.5 V	0.5	0.5 U	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	µg/L	70	0.5 U	0.5	0.5 U	0.5	0.50	0.5	0.5 U	0.5
Dibromochloromethane	ug/L	80	0.5 U	0.5	0.5 U	0.5	0.5.0	0.5	0.5 U	0.5
Methylene chloride	µg/L	5	0.5 0	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Styrene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichloroethylene	μg/L	100	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Trichloroethylene	μg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	μg/L	2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Xylenes, Total	ug/L	10000	0.5 U	0.5	D.5 U	0.5	0.5 U	0.5	0.5 U	0.5
SVOC	1					wita i timor		-		
2,4,5-Trichlorophenol	ue/L	1200		ekali:>cee	www.	Colombico de	10	1	T U	1
2,4,6-Trichlorophenol	pg/L	4.1	**		126.40		10		1.0	l i
2,4-Dichlorophenol	µg/L	46	***		a ##an		10	1	10	1
2.4 Dimethylphenol	ug/L	360	34 MIC.		11 12 12 14 15 15 15 15 15 15 15 15 15 15 15 15 15		1 U	1	10	1
2,4-Dinitrophenol	μg/L	39	* 800		1.00 m		31.0	31	31 U	31
2,4 Dinitrotoluene	ug/L	0.24	**		at one.		(A)	5	Ř	5
2,6-Dinitrotoluene	pg/t	0.049					R		R	1
2-Chioronaphthalene	μg/L	750			***			1	8	1 1
2-Chlorophenol	μg/L	91	so the second				I U	i	19	1
2 Methylnaphthalene	μg/L	36	**		No. of the last of		/a	0.5	R	0.5

OF

Table 6. Summary of Additional Analyses - Phase V

Institute Eastern ^Praperty Boundary Investigation - Phase II through Phase V Union Carbide Corparation, Institute Facility, Institute, West Virginia

	T				Deep Interval F	lesults				-
		Location>> Sample ID>> Depth (ft)>> ample Date>>	INS-0553 0553-GW02-011816 51-55 1/18/2016		INS-0554 0554-GW02-031816 51-55 1/18/2016		INS-0555 0555-GW02-012116 47-51 1/21/2016		INS-0555 0555 GW02-0121160 47-51 1/21/2016	
	3 5								A Section of the Control of the Cont	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL
SVOC (continued)					English of the Control of the Contro		50.000			
2-Methylphenol	μg/L	930	**		**		10	1	1.0	1
2-Nitroaniline	µg/t	190	**:		*.*:		A	1	, R	1
2-Nitrophenol	µg/L	NA .	***				10	1	10	1
3,3'-Dichlorobenzidine	µg/L	0.13	. * *		* * :		R	5	R.	5
3-Nitroaniline	µg/L	NA .	***		li. ≨*er		R	1	R	1
4,6-Dinitro-2-methylphenal	µg/L	1.5			yan (An)		16 U	16	150	15
4-Bromophenyl phenyl ether	µg/L	NA .	***	1	Na Bar			1	*	1.
4-Chlaro-3-methylphenol	μg/L	1400	No.				111	1	10	1
4-Chloroaniline	μg/L	0.37	NAMES IN				8	4	R	4
4-Chlorophenyl phenyl ether	µg/L	NA	**		***		R	1	R	1
4-Nitroaniline	µg/L	3.8	Colored to		4,4,50		R	1	- R	1
4-Nitrophenol	μg/L	42	**		W. W.		31 0	31	31 U	31
Acenaphthene	µg/L	530	nt 89		***		R	0.5	R	0.5
Acenaphthylene	µg/L	NA.	***		26.00		R	0.5	8	0.5
Anthracene	µg/L	1800	## #K		Figure 1.		R	0.5	R	0.5
Benzo (a) anthracene	μg/L	0.012	**				li i	0.5	R	0.5
Benzo (a) pyrene	μg/L	0.2			9.3.33		- .	0.5	A	0.5
Benzo (b) fluoranthene	μg/L	0.034	444		Signal Control		R	0.5	R	0.5
Benzo (g.h.i) perylene	ug/L	NA.					R	0.5	R	0.5
Benzo(k)fluoranthene	μg/L	0.34	443				P	0.5	A SA	0.5
Bis (2-chloroethoxy) methane	μg/L	59	## YE				3 g	1	n n	1
Bis (2-chloroethyl) ether	µg/L	0.014	***				0.052 U	0.05	0.051 U	0.05
Bis (2-chloroisopropyl) ether	µg/L	710	**				N N	1	R	1
Bis (2-ethylhexyl) phthalate	μg/L	6	**:				in the second	5	R	5
Butyl benzylphthalate	µe/L	16					ir.	5	R	5
Chrysene	μg/L	3,4	ner@it	l	() () () () () () () () () ()		i i	0.5	R	0.5
Di-n-butylphthalate	µg/L	900	S## S	1			B	5	R	5
Di-n-octylphthalate	µg/l	200	**		94.		A	5	R	5
Dibenzo (a,h) anthracene	μg/L	0.0034	***				R	0.5	R	0.5
Dibenzofuran	μg/L	7.9		1	N. San			ī	R	1
Diethyl phthalate	µg/L	15000	and and					5	N .	5
Dimethyl phthalate	μg/L	NA			**			5		5
Ethyl ether	µg/L	3900	050	0.5	0.5 U	0.5	0.5.0	0.5	0.5 U	0.5
Fluoranthene	μg/L	800					R	0.5		0.5



Table 6, Summary of Additional Analyses - Phase V

Institute Eostern Property Boundary Investigation - Phase II through Phase V Union Corbide Corporation, Institute Facility, Institute, West Virginia

						and the second	Deep Interv	al Result		21 14.1		
		Location>> Sample ID>> Depth (ft)>> ample Date>>	055	INS-0553 3-GW02-013 S1-55 1/18/2016			INS-0554 0554-6W02-01181 51-55 1/18/2016		INS-0555 0555-6W02-012116 47-51 1/21/2016		IN5-0555 0555 GW0Z-0121160 47-51 1/21/2016	
							Time to the second seco					
Analyte*	Units	MCL / RSL				RL		RL		RI.		RL
SVOC (continued)	f."											
Fluorene	μg/L	290		(80. Jah.)	***************************************		4.0		N. I	0.5	R	0.5
Hexachlorobenzene	µg/L	1		See Table 1			90 Mr 57		R	0,5	R	0.5
Hexachlorobutadiene	µg/L	0.14		Section 1			440		R	1	R	1
Hexachlorocyclopentadiene	µg/L	50		and the second					*	16	R	15
Hexachloroethane	μg/L	0.33							R	5	R	5
Indeno (1,2,3-c,d) pyrene	ug/L	0.034		- 14 m			ar ar VIII		R.	0.5	8	0.5
n-Nitrosodi-n-propylamine	μg/L	0.011		144 de 41				1	R.	1	R	1.
n-Nitrosodiphenylamine	µg/L	12		100			< \$290		R	1	R	1
Nitrobenzene	µg/L	0.14		W W.					R	1	R	1
p-Cresol	µg/L	1900		See Sec.			wa we	1	1.0	1	iu	1
Pentachlorophenol	µg/L	1	32				Sec Sec. 1		5 U	5	50	5
Phenantbrene	ug/L	NA						- 1	R	0.5	A	0.5
Phenol	μg/t	5800		and the second	3. N				10.	1	10	1
Pyrene	μg/L	120	25	and the second second	100		960,966	-1	R	0.5	B	0.5

Table 6. Summary of Additional Analyses - Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

Union Corolae Corporation, in	T					Deep	nterval Results			***************************************		
		Location>>	INS-0573	I	INS-0574	a marika salaman kabinya	TW-105		TW-105		TW-106	
	5	ample ID>>	0573-GW01-012116		0574-GW01-012116		TW105-GW-011416		TW105-GW-011416D		TW106-GW-011416	
		epth (ft)>>	46-50		47-51		48-58		48-58		48-58	
	San	ple Date>>	1/21/2016		1/21/2016		1/14/2016		1/14/2016		1/14/2016	
		Sec. 2013							La Villa			
					A	4,34	Market 199			ji si,	1.	a Nagaras
Analyte*	Units	MCL / RSL		RL		RL		RL	a company	RL		RL
VOC		and the latest and the latest			and the second s				A	W. Samuela A.		
1,1,2,2-Tetrachloroethane	µg/L	0.076	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,1,2-Trichloroethane	μg/L	5	0.5 U	0.5	0.5 Ù	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,2,4-Trimethylbenzene	µg/L	15	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5.0	0.5	0.5 U	0.5
1,2-Dichloropropane	ug/L	5	0.50	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
1,3,5-Trimethylbenzene	μg/L	120	0.5 U	0.5	0.50	0.5	0.50	0.5	0.5 U	0.5	0.5 U	0.5
1,3 Dichlorobenzene	ug/L	NA	0.5 U	0.5	0,5 U	0.5	0.50	0.5	0.5 0	0.5	0.S U	0.5
1,4 Dichlorobenzene	μg/L	75	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
2-Butanone	µg/L	5600	5.U	5	5 U	5	5 U	5	5 U	5	5 U	5
2-Hexanone	μg/L	38	50	5	5 Ü	5	50	5	50	5	5.0	5
4-Methyl-2-pentanone	µg/t	6300	50	5	5 U	5	50	5	5 U	5	5 U	5
Bromodichloromethane	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5
Bromomethane	ug/L	7.5	0.5 0	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Carbon disulfide	μg/L	810	10		10	1	iu	1	10	1	1 U	1
Carbon tetrachlonide	µg/L	5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 Ú	0.5
Chloromethane	ug/L	190	0.5 0	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5	0.5 U	0.5
cis-1,2-Dichloroethylene	µg/L	70	0.5.0	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Dibromochloromethane	μg/L	80	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Methylene chloride	μg/L	- 5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5
Styrene	μg/L	100	0.5 U	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5	0.5 U	0.5
Trans-1,2-Dichtoroethylene	μg/L	100	0.S U	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5	0.5 U	0.5
Trichloroethylene	µg/L	5	050	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
Vinyl chloride	µg/L	2	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.50	0.5	0.5 U	0.5
Xylenes, Total	ug/L	10000	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5	0.5 U	0.5
SVOC	1 25/2	455550			AND THE PARTY OF T	×	MAG W	0.5	MASSET SA	A A A A A A A A A A A A A A A A A A A	22.2	200
2,4,5-Trichlorophenol	µg/L	1200	N. **		un de la companya de La companya de la companya de			le Relina custime Con-	e province a constitution to the constitution of the constitution			. Scored and the Angella Lot
2,4,6 Trichlorophenol	µg/L	4.1		l	10						(*************************************	1 5
2,4-Dichlorophenol	ng/L	46			iu	1					**	
2,4-Dimethylphenol	ug/L	360			iŭ	1					**	1
2,4-Dinitrophenol	µg/L	39	**		30 UJ	30						
2,4-Dinitrotoluene	μg/L	0.24			50	5			**			
2,4-Ombodolene 2,6-Dinitrotoluene	μg/L	0.049			10							
2,6-Dinitrotoisiene 2-Chloronaphthalene	μg/L	750			10	1	######################################		**			
z-Chlorophenol		/50 91			10	1	grija.					
And the second s	μg/L	91 36			■ 11 Head 21 11 11 11 11 11 11 11 11 11 11 11 11	1						
2-Methylnaphthalene	μg/L	L 30	ne de		0.5 U	0.5	1	I				

Table 6. Summary of Additional Analyses - Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

						Deepi	nterval Results					
	1	Location>> iample ID>> Depth (ft)>> nple Date>>	INS-0573 0573-6W01-012116 46-50 1/21/2016		INS-0574 0574 GW01-012116 47-51 1/21/2016		TW-105 TW105-GW-011416 48-58 1/14/2016		TW-105 TW105-GW-0114160 48-58 1/14/2016		TW-106 TW106-GW-011416 48-58 1/14/2016	
Analyte*	Units	MCL / RSL		RL		RL		RL		RL		RL
SVOC (continued)												
2-Methylphenol	μg/L	930			1.U	1	or and the second second					
2-Nitroaniline	µg/L	190	**		10	1	wws.			1	***	l
2-Nitrophenol	µg/L	NA	. W. W.		10	1			944		# € €	
3,3'-Dichlorobenzidine	µg/L	0.13	# #. 		50	5			See as		See and	
3-Nitroaniline	µg/L	NA	1.00 ± 4.00 10.00 € 4.00		10	1			***		# *C	
4,6-Dinitro-2-methylphenol	µg/L	1.5			150	15	***		3.4. I		44	
4-Bromophenyl phenyl ether	μg/L	NA	1 (3) 1 (4) (4) (4) (5)		10	1			1.5 ± 1.5 ±			
4-Chloro-3-methylphenol	µg/L	1400	Ceca		10	1					W W	
4-Chloroaniline	µg/L	0.37	(jeen)		40	4			39.9		.446	
4-Chlorophenyl phenyl ether	pg/L	NA			10	1			\$8640		wes	
4-Nitroaniline	µg/L	3.8	18 W		ίυ	1	**		\$4.		1.00	
4-Nitrophenol	µg/L	42	***		30 U	30			3.4		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Acenaphthene	µg/L	530			0.5 U	0,5	#4.5		- 17	£ 5		
Acenaphthylene	UR/L	NA	**		0.5 U	0.5	4.4		(-0.4)			
Anthracene	µg/L	1800	44		0.50	0.5			(2)			
Benzo (a) anthracene	ug/L	0.012			0.5 U	0.5						l
Benzo (a) pyrene	ug/L	0.2	4.		0.5 U	0.5						
Benzo (b) Iluoranthene	µg/L	0.034	. 1 140		0.5 U	0.5	04° 1964			:		
Benzo (g,h,i) perylene	µg/L	NA			0.5 U	0.5						
Benzo(k)fluoranthene	μg/L	0.34	S Park		0.5 U	0.5					2.5	
Bis (2-chloroethoxy) methane	μg/L	59	C. S. A. L. S		10		And the Control of th				Ger 1	
Bis (2-chloroethyl) ether	µg/L	0.014	3.8 m		0.051 U	0.051	***		183		1000 1000	
Bis (2-chloroisopropyl) ether	µg/L	710			ίυ	1						
Bis (2-ethylhexyl) phthalate	µg/L	6		1	รับ	5						
Butyl benzylphthalate	µg/L	16	0.44		5 U	5	and with				***	
Chrysene	μg/L	3.4	S. 100		0.50	0.5			44	188		l
Di-n-butylphthalate	µg/L	900			50	5	##S			· .		
Di-n-octylphthalate	µg/L	200			5 U	5	2.5					
Dibenzo (a,h) anthracene	μg/L	0.0034	\$ ## N		0.5 U	0.5						
Dibenzoluran	μg/L	7.9			10	1					**	
Diethyl phthalate	μg/L	15000			5 U	5					***	1
Dimethyl phthalate	μg/L	NA NA			5 U	3						1
Ethyl ether	μg/L	3900	050	0.5	0.5 U	0.5	050	0.5	0.5 U	0.5	050	0.5
Fluoranthene	μg/L	800	0.24	l ***	0.50	0.5	V-7 V	1 100	1,000	W.J		1

Table 6. Summary of Additional Analyses - Phase V

Union Carbide Corporation, Institute Facility, Institute, West Virginia

						Deep I	nterval Results					
	ı	Location>> ample ID>> Depth (ft)>> nple Date>>	0573-GW01-012116		INS-0574 0574-GW01-012116 47-51 1/21/2016		TW-105 TW105-GW-011416 48-58 1/14/2016		TW-105 TW105-GW-011416D 48-58 1/14/2016		TW-106 TW106-6W-011416 48-58 1/14/2016	
Analyte*	Units	MCL / RSL		RL		RL	Process of the second	RL.		RL		RL
SVOC (continued)					S20							
Fluorene	μg/L	290	_25 4t		05 U	0.5			1 Megalitics			
Hexachlorobenzene	μg/L	1	v 831 % − 1		050	0.5			i di			
Hexachlorobutadiene	μg/L	0.14			10	1	30-0		2505			
Hexachlorocyclopentadiene	μg/L	50	**		15 U	15					Sapar	
Hexachloroethane	μg/L	0.33	# vs.		5 U	S	***		3846	11 h	148 S	
Indeno (1,2,3-c,d) pyrene	μg/L	0.034	11.46		0.5 U	0.5	***		***		Haraman and	
n-Nitrosodi n-propylamine	μg/L	0.011	59 W.		10	1			1945		100	
n-Nitrosodiphenylamine	µg/L	12	V-9		10	1.	V9.9		100			
Nitrobenzene	μg/L	0.14	3		10	1	(A)		i era i i		100	
p-Cresol	μg/L	1900	**		10	1	288		(94)		1 SA ST	
Pentachlorophenal	µg/L	3	4.5		50	5			16 e :-		金 电等	
Phenanthrene	µg/L	NA	35		0.5 U	0.5	4.8		(##)		***	
Phenol	μg/L	5800	S. Andrews		10	1	304.4	100	gil strijen si il		s + 4. 1191 5 1	
Pyrene	μg/L	120	The second second		0.50	0.5	1.4.4				The second second	

Notes:

Risk-based screening levels (RBSLs) included for comparison are:

The maximum contaminant level (MCL), where available, or the USEPA regional screening level (RSL; November 2015) for tap water; and

The USEPA vapor intrusion screening level (VISL; November 2015), based on a target carcinogenic risk = 1E-05 for the commercial/industrial receptor and 1E-06

for the residential receptor, a target non-cancer hazard index = 1, and an average, regional groundwater temperature = 19 degrees Celsius, is compared to

Bold results indicate detected concentrations.

No shallow interval concentration is greater than the commercial/industrial VISL.

Grey shaded results indicate concentration detected above the MCL/RSL:

Italicized results indicate concentration detected above the Residential VISL

ma/L = milliarams per liter

µg/L = micrograms per liter

NA = Not applicable

U flag indicates the constituent was not detected above the reporting detection limit

Utilities indicates the analyte was below the reported sample quantitation limit. However, the reported value is approximate.

K flag indicates the analyte was positively identified, but the associated numerical value may be biased high.

R flag indicates the sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet the quality control criteria. The presence or absence of the analyte cannot be verified.

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Rescreened Copies of CH2M Hill and EnviroProbe Analytical Vapor Intrusion Investigation Data

Table 2-1. Athletic Facility Area Sampling Results
Eastern Property Boundary Vopor Intrusion Investigation
UCC Institute Facility, Institute, West Virginia

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Mak

	Location	INST-AF-AA01	INST-AF-IA01	INST-AF-IA02	INST-AF-IA03	INST-AF-IA04	INST-AF-IA05	INST-	AF-IA06	INST-AF-JA07	INST-AF-IA08	INST-AF-IA09	INST-AF-IA10
	Sample ID	AF-AA1-082015	AF-IA1-062015	AF-IA2-062015	AF-JA3-062015	AF-IA4-062015	AF-IA5-062015	AF-IA6-06202015	AF-IA6-06202015D	AF-IA7-062015	AF-IA8-062015	AF-IA9-082015	AF-IA10-062015
18.00	Sample Date	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	8/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015
	Screening	populario propositivo de mento de mon									A DESCRIPTION OF THE PROPERTY		
nalyte	Levei*	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				15-4	· · · · · · · · · · · · · · · · · · ·					pain in the State	100
OCs (µg/m²)													And the second s
-Cichtoroethane	77	0.148 U	0.148 U	0,146 U	0.151 U	0.146 U	0.152 U	0.155 U	0.148 U	0.143 U	0.139 U	0.149 U	0.143 U
1-Dichloroethene	860	0.145 U	0.145 U	0.143 U	0.148 U	0.143 U	0.149 U	0.152 U	0.145 U	0.14 U	0.136 U	0.146 U	0.14 U
t-Dioxane (p-Dioxane)	25	3.3 U	330	3.24 U	3.35 U	3.24 U	3,39 U	3.45 U	330	3.19 U	3.1U	3.32 U	3.19 U
inzene	16 🚕	0.585 U	0.585 U	0.575 U	0.595 U	0.575 U	0.601 U	0.611 U	0.585 U	0.586 U	0.549 U	0.588 U	0.568 U
forobenzene	2200	0.169 U	0,496	0,501	0.171 U	0.166 U	0.173 U	0.176 U	0.169 U	0,163 U	0.158 U	0.17 U	0.163 U
laroform	9007.7.5	0.179 U	0.179 U	0.176 U	0.182 U	0,184	0.228 🛼	0 195 B N	0,191 B Av	0.173 U	0.168 U	0.18 U	0.173 U
chlorofluoromethane		1.18	0.852	0.863	0.903	0.909	1,09	1.5	1.39	1.33	1.22	1.23	1.2
OCs Total		1.18	1.348	1,364	0.903	1.093	1.31	1.695	1.581	1.33	1.22	1.23	1.2

Notes

a : Screening levels are based on USEPA regional screening levels (RSLs, USEPA 2015b) for indoor air for a commercial/industrial exposure scenario.

The RSLs are based on a 1E-05 (1 x 10°) target carcinogenic risk for current and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 2001).

- Mot available

NA = Not analyzed

B = The analyte was detected in the associated method and/or calibration blank.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

µg/m_ ≈ Micrograms per Cubic Meter

Bold indicates the analyte was detected

Shading indicates the result exceeded screening criteria (Note there are no representative cases)

DRAFT

FOR SETTLEMENT PURPOSES ONLY INADMISSIBLE UNDER FRE 408

· Defection united were re-screening counts the weeps normerous vists for index our bosses on a forget rish of hopeological his of 0.1 (bosses on my July 1842).

Page 1 of 1

Vapar Intrusion Investigation West Virginia State University, Institu	ora kkinze	Manager			300 55				s as a manner							V.	<u> </u>					, · · · ·	4.1.				- 100	
MAST AUGUST STONE COMMERSHAT DOGGE	erre erre	engruse.			ðu.	ndoor Air	Crawl	Space Air							***************************************		indoor Al		_	_							Exterior Soil Ge	
				Location>>		T-CC-AAOI		CC-CS01	INST-CC-IA01	INST-CC-IA02	INST-CC-IA03 CC-IA 1-06202015	INST-CC TAGE	INST-CC-IA05 CC-IA5-06202015	INST-CC-1A06 CC-IA6-06202015		CC-1407 CC-147-062020150	INST-CC-IA08 CC-IA8-0620201S	9857-CC-1A09 CC-1A9-06202015	0NST-CC-IA10 CG-IA10-06201015	INST-CC-IA11 CC-IA11-06202015	INST-CC-IA12 CC-IA12-06202015	INST-CC-IA13 CC-IA13-06202015		-CC-IA14 CC-IA14-06202015D	PMST-CC-IA15 CC-IA15-06202015	0572-01-012016	1945-0572	1 0572-02-020
				Sample (D>>	CC-AA1-0520201 0 - 0	5 CC-AA1-05202015D 0 - 0	CC-CS1-06202015 0 - 0	0 - 0	CC-1A1-06202015 0 - 0	CC-4A2-06202015	0 - 0	CC4A4-06702015	G-Q	0 · 0	0.0	0.0	0 - 0	0 - 0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5 - 5	12 - 13	12-13
	1 1	San James Committee		Sample Depth (feet)>> Sample Date>>		6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/26/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	6/20/2015	1/20/2016	2/5/2016	2/5/2010
	1 1		Screening Lovels (8			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		2007		1 S 45 5 7 A						300			3									l
		Commercial/Industrial	Communicated back-rand	Residential	4.4			3.5			1 1							1										
Analyte	Unit	Indoor Air RSL	5,54 C.42 W.S.	Soul Gos VISE	<u> </u>																-		-		-	4.91 U	4.91 U	SSUI
.1.1-Trichloroethane	pig/m	22000 2.1	49499	170000						448		1	Qen.	144	2.	Alp-	**		**							6.18 U	6.18 U	6.9 UI
I.1.2.2-Tetrachioroethane I.1.2-Trichloro-1.2.2-trillisoroethane	hite.	130000	a designation	1000000			##			59.4			524	South S		446 A. I		**		60 (4)	18.8	***	100	14	300	6.9 U	6.90	150)
1,1,2-Trichloroethane	us/m³	0.86	3.8	5.8	- 10	**		9.5					99.	***		44	**	2,4	K.F.				44	1	24	4.91.0	4.91 U	5.5 U/
1 Dichlomethans	villes"	n	100000	58	0.170	0.156 H	0.168.0	0.152 U	0,249 ()	0.155 U	0.156 U 0.152 U	0.159 U 0.156 U	0.152 U 0.149 U	0,147 U 0.144 U	0.145 U 0.145 U	0.147 U 0.144 U	0.154 U 0.151 U	0,143 U	0.145 U 0.142 U	0.156 U 0.152 U	0.18U 0.1/7U	0.166 U 0.161 U	0.153 t/ 0.152 t/	0.151 U 0.159 U	0.137 UI 0.134 UI	3,64 U 3,57 U	3,64 U 3,57 U	401 433
1-Dichloroethene	ug/m	880		7000	0.1671	0,152 U	0.165 Li	0.149 U	0.146 U	0,152 0	0.452.0	9.1390	0.1450	30,340,00		227	1 ""				27.0	01447-0		67.4.52.60	0.23401	6,68 U	6.68 U	150/
2,4-Trichlosobenzano	his/m	8.8		240							(0.46)		186	14		44	**	3.6			100		486	24	36.9	4,43 U	4,43 ()	490
1,4-Trimethylberuene 1-Oibromoethane (EDS)	usim'	6.2		0.16	1.44		100	Sec. 32.		1.00	A4C	3.0	i dawa	1-40	**	146	146	1 Sec. 1	**	10.00	***	75.	*61.75	**		6.92 U	6.92 U	7.70
ż Dichigrobenzeno	ug/m	880	- 37/88/8	2000	**	- KS	**	100	30	24.85			Deal.	35%			3.5	2000		* * :	3 5	***		***	1 m 100 m	5.410	5.410	6.02
2-Dichloroethane	pag/im*	4.7	¥₩:	3.6	347		11 (M)	344		5,68		(67 to 13	- 1355 v - 1384 v			39. 1		3.00	(Winds	500	**	7.5		1 1	2×	3.64 U 4.16 U	3.64 U 4.16 U	4.5 U
2 Dichioropropane	sug/m	и	- 34%	9.4									100			144	9.5	7.5		See	2					6.29 U	6.29 U	7.01
2 Dichloroletrafluoroethene	sig/m'	NA NA	· 排練	NA.			124	4.		Cap.		Spine	1,320 00	2.0	48	188	1	1940	**	49	- 59	4.6	7,65			4.430	4,431	4.90
3.5-Trimethylaenrame 3-Dichlorobenrame	us/m	NA I	14	N/A				Service St	1979	3660 0	14.0		200	1	#50	+8	10.00	See S		9.8		**	100	Are	***	5.41.0	5.41 U	601
4-Dichlorobenseno	suc/m*	n S	480	85		**	1.5	1 1 2 2 3			44.00	34	***	1.0	No.	(400)	199	1. 225.34		3,46.U	4.03 Ú	3.70	3.45 u		3.04 (r)	5.41.U 3.24.U	5.41 U 3.24 U	501 35 U
A-Dioxane (p-Dioxane)	seg/mi.	25	13,0	" " . n 5 ²	3,810	3.46 U	3.74 U	3.39 0	3.32 U	3,45 U	3460	3.54.0	3.19 U	3.28 U	3.34	(2)	3.43 U	3.190	3.23 U	2,40.0	*.03.0	3.70	3,450	3.61 U	3,00,01	30.0	2.65 U	55U
Butanone	pg/m*	22000437407		170000 1 187	1100	100			1											54					4.0	3.69.0	3,69 U	820
Hexanona Methylnophtholene	yat/m sat/m	130 NA		CZ NA	1					1	Sec. 1	3.8	1986	\$40 mm	tea.		L Text	440	4.5	100	Service :			++		5.24 U	5.24 U	100
Mothyl-2-pentangne	pg/m	13000	68690	100000				44.5	10 Teach	344	**	39.4	14.6		dian-	458	* 1,**	***	1 to 1	10.00	**	**	3.0	25		3.69 U	3 69 U	870
cetone	sig/mi*	140000 🛂 🕽	Servey VIII	1100000	597 -	*		100		H 189 LH	1.00	300	100		-dis-	3438		Sec. 1997	15	**				***		130	6.98 NJ 1.95 U	5,83 4,31/
rylonkrite	yg/m*	14 /.	10 × 3	1.4				in 2004 to 1	0.588 U	0.611.0	0.614 U	0.627 U	0.6010	0.582.0	0.565 U	0.582.0	0.608 U	0.566 U	0,572 U	0.614 U	0.712 U	0.657 U	0.633.0	0.64 u	0.5410	1.95 U	1.88 U	320
rniekė:	bu/m	16 (1)(2)	* 0%	12 w" 1.9	0.675 U	0.614 U	0.663 U	0.601 U	0.360.0	Addition .	0.0140	*******			7.7	19			99	7.0				1.0		4.66 U	4,66 U	5.2 0
anzył chłoride is (2-chłoroisopropył) ether	us/m.	2.5 MA	機能	64			1			1.00		4.2			SA.	2.0	***	404	**:	84			48.	66	44	6.3 U	630	100
romodichloromethane	ug/m*	111		25			**	3.00	100					170	***	19.6	54.0	900	8.9	57	*			**	数 第	5.03 Ú	6.011	6.7 U
omotorm	ug/m*	110	(800)	65	344			S. 100	**	**		12	2,175		**		. jedų		3654					*	. C S	9.1 U 3.5 U	9,3 U 3.5 U	10 U
romoinethane	sig/m	22	4.54	170	1			***	2.4	**		1	246	1	20					1 N		(4) (4)				28.5	2.80	330
arbon disulfide arbon tetrachinalde	ug/m*	3100 JAG	anima Pall	24000							4.0	1. 36		The state of	14 A	**			36.80	3.5	1.64	-			Street	5.66 U	5.66 U	6.310
intron tetratrivorioe Novobenzene	lagar.	220_22A	15	1700 110	0.1940	0.177 N	0.191.0	0.173 0	0.17 U	0.176 U	0.172.0	0.181.0	0.173 U	0.168 U	0.169 U	0.312	0.175.0	0.163 U	0.165 U	0.177 U	0.205 U	0.189 U	G 176 U	0,184 U	0.155 00	4.14 U	4.14 U	460
Moroethanic	satisfies.	44000	Lightenin.	350000		¥-			100			300		A SAAD			1.0			4.00		5.00	200			2,36.0	2,38.0	2,6 U
darafarm	pac/m²	53000	300 A 73	4.1 4	0.706 U	0.1880	0.2030	0.184 U	0.180	0.187 0	0,1881	0.192 0	0.256	0.178U	0.179 U	0.178.0	0.1861/	0.173 U	0.175 U	0.188.0	0.218.0	0.201 U	0.1870	0.196 U	0.165 U/	1.861	4.4 U 1.86 U	49U 21U
documentanc	sug/en	390		3100 MA			Se de			- 3	1 3	244	1.00		311	100	44			die.						3.57 U	3.57 U	410
s-1,2-Dichlaroethylene s-1,3-Dichlaroptopene	ug/m*	44	- 100	NA.	1				44	1.0			1.5%		8.6	11.3%		1.00		4.5	100		1.0	144		4.09 U	4.09 U	45 U
ibramochlosomethane	sig/m*	PEA .		IIA _		4.6	199	100		**	****	44.5	- 49	7	965	76	1.544	N*s.	**	- 特	544		1.00	100	98.	7,670	7.67.0	850
lchlorodifizoromethane	us/m	460 444	988	3500 53	1				78 🕶	7*	-	477	239		**										\$	(08)	172 3.91 ∪	210 / 4.3 U
hylbenzene	ug/m	49 1.4 6-4	1000 4 44	37.	39.85		***	***			1 12 11	14.4	3.0		1							I			3.5	9.490	9.49 U	210
exachlorobritadienn	ug/m²	5.6 40 (4)4	150	1500 TSC	1					1 3.2		198			2.5											14.9	7.62 0	8.1
g-Xylene rthylene chloride	ug/m²	440 (,11°4), 2600	10000	3400	1						1 +x		2440		¥		gode t	-	F 34 3	364	# E		-4.4.f	100	44	3.110	3.13 0	3,5 U
Sutylbanabne	DE/m*	884 /		NA .	Distribution	**		39	100	1986			946	1.0	30%				***	3.5	1 St 1		1 388	1.76	3.5	4.94 U	4,94 U	.55 U
Hexane	hig/m/*	3100)	anere W. C	24000	1999	986			6.	250	1 75				all and a second	34.9	596.81		300	2.5			1830 1830			55.6 4.42.U	3.17 U 4.42 U	3.5 UI 4,9 UI
Propylbenzane	şigim t	4400	1000000	35000	1			**		1946	124	199	1344			100									19.74	4.72.0	4.72 U	520
phthalene	ig/m	16 UU		3500 3 1	1		1 85 1 88				43.	24.4	Las Sel		1 a 22	130			iów.	3.4	1 1		Seat	44	3.7	5.12	3.91 U	5.11
Cylene Hene	int/m	4400	\$1000EE	35000					State 1	1 34	96	844	Page 11.	18. 38	1 70	est/	***			1			15 35	100	3 m	3.830	3,83 U	4,3 U
rome rt-Butyl Methyl Ether	pag/m²	470	S Banking	360	D -		- Al-	**	27 4 9		2.50		- +++- · ·		1 300	**	178.8		16 m.	394,1			3.0			3,25 u	3.25 u	360
trackloroethene	wg/m²	150	300 ,00	A 160 C	X				Salice					1	1		244		3.4	1		20.0	200			6.31 ij . 27.6	5.11 U 3.39 U	58U
anne.	insten	22000 CA	remark a f	1/0000			1 . **			1	1	***			9.5			1	I	1 5	1 5	300			154	3.570	3,57.0	417
ns 1,2 Dichloroethylene	HAZYYY	NA NA		NA NA							1 20				1 44		4.5	1.5	300	in 1	1 in the second	SA :			34	4.09 U	4.09 U	4,51
et-1,3-Okkloropropen e chloroethylene	sig/m"	6.8	100	16				l 2 3		1	- AND 1	44.	1		366			1	**	136	- AP	1	4.4	**		4.83 U	4.83 U	5.41
chiorofluoromethane	pg/m	NA.		NA	0.886	1,09	\$,49	3	1.4	1.19	2.54	1.54	1.16	3.34	1.35	1.65	1,27	1.19	1.23	1.22	1.37	4.74	10.7	9.77	1,943	20.8	8.06	11.7
nyi acetale	istin'	580	986	7000				* *		1. 544	1 **			13:15:1	**:									1	32	3.37U 23U	3.17 U 2.3 U	35 U
inyl chłoriste	sig/en	28	1995	2.7	0.000	1.00	5.40			1.19	154	1.54	1,416	1.14	1.45	9,402	1,27	1.19	1.23	1.22	1.17	4.74	10.7	9.77	1.54	776.69	187.04	240,5
aria's testal																												

Screening by size and based on under a regional accreting mine (male, under a constitution of a composition of a composition of the accreting mine (MO) of one (1) (MVDEP 2001).

The RSLs are based on a 1E-05 (1 x 10) target carefungation task for current expension accessing and a composition concern hazard quotient (MO) of one (1) (MVDEP 2001).

b : Soil gas screening levels are based on USEPA (2015c) repor intrusion acrossing forcis (VISLS). ViSLs are based on a alientation factor of 8.03.

U.E.* The enables was below the reported sumple quantitation sink. However, the reported value is approximate upon? * Micrograms per Cubic Mater.

ed results indicate concentration was detected above the Residential Soft Gas Visi.

INAPARASIBLE UNDER FRE 408

" Detected victures were compared to the USEPA Commercial index Ar VIII, commercial extense sources uit, and reserved and later of Run of LOE do and till = 0.1 (May 2016 Run)

Torget from 1.02-06 HQ = 0.1 May 2016

Table 2-3, Eastern Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute, West Virginia

Eplit Sample

Section Section 1			Location>>	INS-	0569		INS-0571 🖖	an and the second secon
			Sample ID>> Sample Depth (feet)>> Sample Date>>	0569-01-011516 5 - 6 1/15/2016	0569-02-011416 13 - 14 1/14/2016	0571-01-020516 5 - 6 2/5/2016	0571-01-0205165 5 - 6 2/5/2016	0571-02-012016 11 - 12 1/20/2016
		RBS						
Security of the second of the		Communical/Industrial	Residential					
Analyte	Unit	Seel Cas VISL	Soil Gas VISL					i in same city
1,1,1-Trichloroethane	ug/m³		170000	4.99 U	5.38 U	4.77 U	5.5 UJ	4.55 U)
I,1,2,2-Tetrachloroethane	ug/m³		1.6	6.28 U	6.77 0	6.01 U	6.9 UJ	5.73 UJ
,1,2-Trichloro-1,2,2-trifluoroethane	ug/m²	34003000	1000000	7.02 U	7.56 U	6.7 U	15 UJ	6.39 UJ
.1.2-Trichloroethane	ug/m³		5.8	4.99 U	5.38 U	4.77 U	5.5 UJ	4,55 UJ
,1-Dichloroethane	ug/m³	i kum	58	3.71 U	3 99 U	3.54 U	4 UJ	3.38 UJ
,1-Dichloroethene	µg/m³	79000	7000	3.63 U	3.91 U	3,47 U	4 UJ	3.31 UJ
2,4-Trichlorobenzene	µg/m³		70	6.79 U	7.32 U	6.49 U	15 UJ	6.19 UJ
	µg/m³	200 (CC)	240 21	13.2	4.85 U	430	6.8 J	21.41
,2-Dibromoethane (EDB)	µg/m³		0.16	7.03 U	7.58 U	6.72 U	7.7 UJ	6.41 W
2-Dichlorobenzene	ue/m³	2900	7000	5.5 U	5.93 U	5.26 U	6W	5.01 UJ
2-Dichloroethane	ug/m³	trie	3.6	3.71 U	3.99 U	3.54 U	4 U)	3.38 W
2-Dichloropropane	μg/m³	310	9.4	4.23 U	4.56 U	4.04 U	4.6 UI	3.85 UJ
2-Dichlorotetrafluoroethane	µg/m³		NA	6.4 U	6.9 U	6.12 U	7 UI	5.83 UJ
3,5 Trimethylbenzene	vg/m	w. /	NA /	5,35	4.85 U	4.3 U	17.1	7.31
3-Dichlorobenzene	ug/m¹		NA NA	5.5 U	5.93 U	5.26 U	6W	5.01 UJ
4-Dichlorobenzene	μg/m²		8.5	5.5 0	5.93 U	5.26 U	6UJ	5.01 UJ
4-Dioxane (p-Dioxane)	ug/m		19	3.3 U	3.56 U	3.15 U	3.6 U)	3.01 UJ
-Butanone	ug/m)	10000 144	19 170000 NUN	9.45	24.4	2.58 U	5.9 VJ	3.391
-Hexanone	ug/m³	4,410	1000	3.75 U	4.04 U	3.58 U	8.2 UJ	3.42 UJ
-Methylnaphthalene	ug/m²		NA	5.32 U	5.74 U	5.09 U	7.5	4.85 UJ
-Methyl-2-pentanone	ug/m³	A CONTRACT OF THE PROPERTY OF		3.75 U	4.04 U	3.58 U	8.2 <u>U</u> U	3.42 U)
cetone	μg/m³	40(20)	100000 (2),000 1100000	8.65 NJ	108 NJ	19.3	118	14.83
crylonitrile	ug/m³	94	1.4	1.99 U	2.14 U	1.90	430	1.81 W
enzene	µg/m³	7063	12 /	2.92 U	4.88 NJ	2.79 U	3.2 UJ	2.66 UJ
enzyl chloride	ng/m,		1.9	4.74 U	5.11 U	4.53 U	5.2 U)	4.32 UJ
is (2-chloroisoprapyl) ether	ug/m³		NA.	6.4 U	6.9 U	6.121)		5.84 UJ
romodichloromethane	ug/m³		2.5	6.13 U	6.61 U	5.86 U	6.7 UJ	5.59 UJ
romoform	ug/m²		85	9,46 U	10.2 U	9.04 U	10 UI	8.62 UJ
romomethane	μg/m ¹	7	170	3.55 U	3.83 U	3.4 U	3.9 UI	3.24 UJ
arbon disulfide	ug/m³	rouseus V	24000	2.85 U	3.07 U	2.72 U	3.71	2.6 UJ
arbon distinde arbon tetrachloride	h8/m ₃		16	5.76 U	6.21 U	5.5U	6.3 UJ	5.25 UJ
arbon tetracnioride Norobenzene	ug/m³		1700	4.21 U	4.54 U	4.03 U	4.6 UJ	3.84 UJ
And a second of the second of	n8/w, n8/w	150000	350000	2.42 U	2.6 U	231U	2.6 UJ	2.2 UJ
hloroethane								A
hloroform	μg/m³		4.1	4.47 U	4.82 U	4.27 U	4.9 UJ	4.07 UJ
hloromethane	ug/m³		3100	1.89 U	2,04 U	1.81 U	2.1 W	1.72 W
is-1,2-Dichloroethylene	µg/m³	11/6	NA NA	3.63 U	3.91 U	3.47 Ü	4 UI	3.31 UJ
is-1,3-Dichloropropene	ug/m³	100	NA	4.15 U	4.48 U	3.97 U	4.5 UJ	3.79 U)

Table 2-3, Eastern Area Sampling Results

Vapor Intrusion Investigation

West Virginia State University, Institute, West Virginia

Dibromochloromethane .	µg/m³		NA NA	7.80	8.4 U	7.45 U	8.5 UI	7.1 UJ
Dichlorodifluoromethane	μg/m³	1,5000	3500	4.53 U	4.88 U	4.33 U	4.9 UJ	4.12 UJ
Ethylbenzene	µg/m³	المال المالية	37 🖊	4.86	4.28 U	3.8 U	5.51	3.62 UJ
Hexachlorobutadiene	μg/m³	190	43 ~(0	9.65 U	10.4 U	9.22 U	21 W	8.79 UJ
m,p-Xylene	µg/m³	15000 1500	3500 5	25.1	8.57 U	7.6 U	9.41	7.24 UJ
Methylene chloride	μg/m³	18900	3400	3.18 U	3.43 U	3.04 U	3.5 W	2,9 UJ
n-Butylbenzene	µg/m³	anaoon o Ma	COLS SOUR	5.03 U	5.42 U	4.8 U	5.5 UJ	4.58 UJ
n-Hexane	ug/m³	100000	24000	3.23 U	13.7 NJ	3.08 U	3.5 UJ	2.94 UJ
n-Propylbenzene	μg/m³	120000	35000	4.5 U	4.85 U	4.3 U	4.9 UJ	4.1 UJ
Naphthalene	ug/m³	130	2.8	4.8 U	5.17 U	4.59 U	5.2 UJ	4,37 UJ
n-Xylene	μg/m³	1 Spings 1/202	3500 350	7.55	4,28 U	3.8 U	9.51	3.62 UJ
Styrene	ug/m³	1500000	35000	3.9 U	4.2 U	3.73 U	4.3 UJ	3.55 UJ
tert-Butyl Methyl Ether	μg/m³	Leans .	360	3.3 U	3.56 U	3.15 U	3.6 UJ	3.01 UJ
Tetrachloroethene	μg/m³	600	360 140	6.21 U	27	5.93 U	6.8 U)	5.66 UJ
Toluene	με/m³	7 80000 † 3 ,07	170000 JUST	18.9	53.7	3.3 U	5.51	3.14 U)
Trans-1,2-Dichloroethylene	µg/m³		NA NA	3.63 U	3.91 U	3.47 U	4 ()	3.31 UJ
trans-1,3-Dichloropropene	µg/m³	MA	NA .	4.15 U	4.48 U	3.97 U	4.5 UJ	3.79 UJ
Trichloroethylene	μg/m³	200	16	4.92 U	5.3 U	4.7 U	5.4 UJ	4.48 UJ
Trichlorofluoromethane	μg/m³	- 1 / 1 / 1 / 1 / 1 / 1 / 1 / 1 / 1 / 1	NA 🗸	5.89	10.6	4.91 U	5.6 W	4.69 UJ
Vinyl acetate	μg/m³	7403	7000	3.22 U	3.47 U	3.08 U	3.5 UJ	2.94 UJ
Vinyl chloride	µg/m³	130	7.7	2.34 U	2.52 U	2.24 U	2.6 UJ	2.13 W
VOCs, Total	µg/m³	to the distance of the	NA	98.95	242.28	19.3	68.4	46.89

Notes:

- a : Soil gas screening levels are based on USEPA (2015c) vapor intrusion screening levels (VISLs). VISLs are based on a attenuation factor of 0.03,
 - a 1E-06 (1 x 10-6) target carcinogenic risk for hypothetical, future residential exposure, a 1E-05 (1 x 10-5) target carcinogenic risk for commercial/industrial use, and a target non-cancer hazard quotient (HQ) of one (1) (WVDEP 200
- -- = Not analyzed
- I = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.
- NA = Not available
- NJ = The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- U) = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.
- ug/m3 = Micrograms per Cubic Meter

Bold indicates the analyte was detected

time splined results unlicate concentration was detected above the Commercial/Industrial Soil Gas VISA thirte there are no representation eavest

Italicized results indicate concentration was detected above the Residential Soil Gas VISL (Note there are no representative cases)

* Detected constituents were re-screened argument the USERA commercial and resclentical visit terrest extends some re-screened argument by sed on the attempt tist to the out and the terrest on may do to the state)

DRAFT - FOR SETTLEMENT PURPOSES ONLY INADMISSABLE UNDER FRE 408

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DRAFT

FOR SETTLEMENT PURPOSES ONLY

INADMISSIBLE UNDER FRE 408

· NO EXCEPTION

Table 2-4: Faculty Housing Area Sampling Results
Vapor Intrusion Investigation
West Virginia State University, Institute; West Virginia

				A 11		Outdoor Air			Subslab S	Soli Vapor		45	Crawl Space Air						
	T		The same of the same	Locations		HIST FR-AAOI			INST FR-SSOI		INST-FR-5502		INST-FR-C301		INST-FF		INST F		
				5ample IO>>	FR-AA1-06192015 0 - 0	FR-AA1-012616 0-0	FR-AA01-0127165 0 - 0	F#-5501-0129165 0 - 0	FR-5501-020316 0-0	FR-5501-0204165 0 - 0	FR-5502-020316 0 - 0	FR-CS1-012616	5R-C51-0136160	FR-CS01-0127165 9 - 0	FR-IA1-06192015 0 - 0	FR-IA1-012616	FR-(A2-06192015 0 - 0	FR-(AZ-012716 0 - 0	FR-1/A3-06192015 0 - 0
				Sample Depth (feet)>> Sample Dute>>	6/20/2015	1/26/2016	1/26/2016	1/28/2016	2/3/2016	2/3/2016	2/3/2016	1/26/2016	1/26/2016	1/26/2016	6/20/2015	1/26/2016	6/20/2015	1/27/2016	6/20/2015
	I F		Screening Levels ***	2500					1.00					77.7		1 - 15 - 114 - 11 - 11 - 11 - 11 - 11 -		7.045155	1 22.00
A STATE OF THE STA		Residential	Economical/economical	Residential											1				
Analyte	Unit	Indoor Air RSL	Sed Gas 988	Soll Gas VISL	-								-			-			
1-Trichloroethane	με/en'	5200		170000 1.6	200,700	0,188 UI 0.236 UI	0.273 til 6.9 til	0.273 UI 6.9 UI	4 K U 6,04 U	5.5 U 6.9 U	5.44 U 6.84 U	0.19 U 0.239 U	0.19.0 0.239.0	6.273 U 6.9 U		0.222U 0.279U		0.206 U 0.26 U	
7,2-Tetrachioroethana 2-Trichloro-1,1,2-trifluoroethana	int/w,	0.048	second .	100000\$	1.00	0.51.1	0.7871	0.8053	6.74 U	15 U	7.64 U	0.506	0.531	0.775		0.557	25	0,512	***
2-Trichlurgethane	iug/m	0.18	3000000	5.8	200	0.188 UI	0,273 UI	0.273 Uz	480	5.5 U	5.44 U	0.191	0 19 U	0.273 U		0.22211	3,50	0.206 U	
Dichignoethane	uk/m'	1.8	7600	58	0.152.0	0.139 U/	0.202 UJ	0.202 U)	3,56 U	4.0	4,03 U	0.141 U	0.141.0	Ø.292 U	0.152 U	0.165 0	0.16410	0.153 U	0.146 U
Dichloroethene	14g/m	210 (1.)	- X	7000	0.149 U	0.136 tij	0,198 Ui	0.198 (/)	3,49 U	40	3.95 U	0.138 U	0.138 U	0.198U	0.205	0.161 U	0.201	0.15 U	0.213
4-Trichtorobensone	we/m²	23 .4.3.1	- A	70 1 ♥	200	0.255 U.I.	15 UI	150/	6.53 U	150	7.4 U	0.258 U	0.366	15 U		0.302 U	wa:	0.281 U	144
4-Trimethylbenzene	ve/m*	12 (5.17.3)	- CO	240 Sand	ű.a.	0.169 (J)	0.246 UI	1.117	4.33.0	4.9 U	4.9.U	0.171.0	0.241	0.2460	**	0,246	1.0	0.186 U	
Obromoethane (£08)	us/m'	0.0047	168	0.16	,470	0.264 UJ	0.384 UJ	0.384 UI	6.7613	7.70	7.66 U	0.267 U	0.267 0	0.384 U	1.84	0.313 U	**************************************	0.291 U	
Dichlorobenzene	vz/m'	210	2000	7000	10,000	0.207 UI	0.301 UI	Ø.301 UI	5.29 U	611	5.99 ()	0.209 U	.0.209 U	0.301 U	1.00	0.245 U		0.228.0	96.00
Dichloroethane	ug/m	0.11	₩ 10	36	540	0.139 U/	0.202 UI 0.231 U)	0.202 UI	3.56 U 4.07 U	40 46U	4.03U 4.61U	0.141 U 0.161 U	0.141 <i>1</i> 7 0.161 <i>1</i> 0	0.202 U 0.231 U		0.165 U 0.185 U	10° A	0.153 U 0.175 U	
Dichloropropane	μ <u>ε</u> /m	0.28	* W1	94 /	**	0.159 UI 0.24 UI	7 Ui	0.231 U) 7 UI	6.15 U	711	6.97 U	0.243 U	0.243 ()	70		0.284 U		0.265 U	
Okhlorotetrafluoroethane 5-Trimethylbonzene	ug/m'	MA Z		10.2	4.4	0.16910	4.9 (4)	490)	4.33.0	4.9 U	49U	0.171.0	0.171 U	490		0.20		0.265 U	
Dichiorobenzone	ug/m'		66.60	8/4	A SARAH	0,207 UJ	0.301 U	0.301 U/	5.29 U	60	5.99 U	0.209 U	0.209 U	0.301 U		0.245 U		0.228 U	
Dichioroben tene	ue/m²	0.00	31	85 7/5		0.207 UJ	0.301 U1	0.7861	5.29 U	ă Ü	5.99 U	0.209 U	0.209 U	0.301.0		0.245 U	and the second	0.228 U	
-Dioxane (p-Dioxane)	INE/m1	0.56	880	,, t) 19 A	3,39 U	3.100	3,6 UJ	3.6 tu	3.17 0	3.5 U	3.59 U	3.130	3.130	3.60	3,39 U	3.70	3,65 U	3.410	3.24 U
otanone	us/m	S2007	to Market	2 120000 W		0.6631	5.9 ())	5.9 Ui	2.59 U	5.9 U	2.94 U	1.25 /	0.6951	5.90		0.861		1.64	
texanone	us/m	31	A Marie	1000	(434	3.52.01	#.2 t/J	8.2 UI	3.6 U	820	4.08 U	3.560	3.56 U	#2U	A# -	420		3,88 U	. 49
Aethylnaphthalene	ug/m²	H/A	89	NA ,	75	10 (//			5.120		5.8 U	10.10	10.1 U	999	419	11.80	187	11.0	9 ¥40.
dethyl-2-pentanone	1182/10	3108X	suspensi X	10000(X	No. 1	3.3.1	8.2 W	8.Z U/	360	820	4.06 U	2,33	2.2	8.2 U	**	2.79	***	3.04	
tone	sig/m	3200%	Free K	1100000X	5.5	11.23	(11)	263	2.09 U	7.2	2.37 U	12.5)	9.761	19		13.17		A.12.J	L .
ylonitriic	nE/m,	0.041	WV	2.4	0.601.0	1.87 U/ 0.601 J	0.109T) 0.855.)	0.109 U/ 0.674 J	1910 2810	4.3U 3.2U	2.16U 3.18U	1.89 UI 0.585 / "	1.89 UI 0.627	0.109 ti	0.601 U	2,2 (r) 0,709 ×	0.647 U	2.05 U) 0.942	0.585
riene izvi chladde	ug/m'	0.36	27 o.	19	3,004.0	0.178 UJ	5.2 (J)	5.2 Ui	4.56 U	520	5.160	0.218	0.180	5.20	W.0562.50	0.211 U	0,000	0.196 U	u.senge
styl chiarac (2-chiaralsopropyl) ether	us/m'	0.057	8.6.5	M Y	49	60101	200		6,160	***	6,970	6080	6.08.0	4100		7.10		6.62 U	100
smodichforomethane	ug/m"	6,076		2.5	1 ST 1	0.23 UI	0.335 U/	0.335 U/	5.9 u	6.70	6.68 U	0.233.0	0.233 U	0.335.U		0.273 U	100	0.254 U	
molorm	we/m*	2.5	(46)	85	***	1.781//	10 U	100/	9.09 U	100	10.3 U	1.60	1.8U	1011		2.10	\$2.5	1.96 U	Ave
amomethane	ve/m'	5.2		170 -	1.44	0.668 U.I	3.9 03	3.9 01	3.42 U	390	3,87 U	0.675 U	0.675 U	3.90		0.79.0	, A.	0.735 U	200
rbon disulfide	ve/m'	73 0	man A	24000	4.8	0.107 UJ	3.100	8.81	2.74 U	3.1.0	3.10	0.108 U	0.108 U	310	**	0.127 U	144	0.118 U	364
rbon tetrachiotide	ve/m*	0.47	*** W.	16		2.16 (//	0.752.1	9.7631	5.54 U	630	6,27 U	2.190	2.19.0	0.754	S - N - 1995	2.56 U	gara.	2.38 U	100
dorobentene	9K/m1	52		1700	0.173 U	0.158.03	4.6 UI	4.6 UI	4.05 U	4.6 U	4.59 Q	0.160	0.160	4.6.U	0.1730	0.187 U	0.1860	0.174 U	0.166 U
loroethane	pg/m	10000	£998(88)	350000	100	0.0907 U	0.132 Ui	0.132 UJ	2.32 U	2.6 U	2.63 U	0.0918 U	0.0918 U	0.132 ti		0 107 U		0.0999 U	1.000
ioraform	pg/m	0.12	77		0,184 U	0.168 UJ	0.244 Ui	0.5421	430	4,911	4.87 U 2.06 U	0.17U 1.8U	0.17 U	0,244 U 2,1 U	0.1841	0.199 U 2.1 U	0.1980	0.185 U	0.176 U
loromethane	pg/m	94 (A)(A)	1000	316%	8-10- 1-10-1	1.77 U) 0.136 U)	2.1 U) 0.198 UI	2.1 U) 0.198 U)	1.87 U 3.49 U	2.1 u 4 u	3.95 U	0.1380	0.1380	0.198 U		0.161 U		1.95 U 0.15 U	
-1,2 Dichloroethylene	99/111	NA NA	### ###	NA NA		0.156 UI	45.01	4.5 tu	3.99 U	4.5.0	4.52 U	0,1581/	0.158 U	45U		0.185 U		0.172.0	
1,1 Olchloropropene iromochloromethane	ug/m" ug/m"	100	44	N/A	2.8	0.793 UJ	8.5 Uz	8.5 tu	7.49 U	85U	8.49 U	0.2960	0.296 U	850		0.3471		0.322.0	5.00
hiered fluoremethane	we/m'	iod	100	3500~	201	2.391	3.751	3.641	4.35.0	490	4,93 U	2.38 /	2.51	3,64)		2.54		0.468 U	
Whentene	us/m'	ii/		37	**	0.149 UI	0.281)	2.231	3.821)	4.30	4.33 U	0.151 U	0.163	0,504	**	0.177 U		0.408	
xachlorobylatiene	ug/m*	0.13	\$10.5	4,3	1 Sept.	0.363.01	21 01	21 03	9.28 U	210	10.50	0.367 U	0.367 U	21.0	300	0.429 U	34.5	0.399 U	3.80
p-Xylene	#8/m"	100 () ()	1.000	asod		0.393	0.755 /	7.031	7.64 U	430	8.66 U	0.45\$	6.49	1.32		0,481		1.51	III item
ethylene chloride	us/m1	100 19.3	100 7	3400 🖓	1 424	5.97 UJ	0.866)	3201	3.06 U	350	3.46 U	6.04 U	6.04 U	4.1		7310	3.5	6.57 U	
lutylbenzene	uu/m"	MA _rtm	99	NA.	34	0.189 UI	55 tu	5501	4.83 U	5.S U	5.47-0	0.191 U	0.191 U	5.5 U		0.223.0	**	0.208 U	3 W.
lexang	jug/m"		eesK.	24000	A Search	0.6491	3,50/	8.87	3,10	350	3.51 U 4.9 U	0.67 0.171 U	0.771 0.171 U	35U 49U		1.15 0.2 U		1.69	
ropylbeniene	ing/m²	0.083	**************************************	35000 2.8 /	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.169 U) 0.18 U)	4.9 UI 0.262 UI	4.9 UI 0.368 I	4.32 U 4.61 U	4.9 U 5.2 U	5.23 U	0.1820	0.5811	0.262.0		0.736	V	0.186 U 0.198 U	3.00
rhithallene viene	με/m' με/m'	100 10		350A	F	0.149U1	0.4231	4.03 J	3.82 U	4.3 U	4.33 U	0.197	0.193	0.831		0.201		0.574	
grene ene	instan,	1000		35000		0.146 UJ	0.213 01	0.213 0/	3.75 U	430	4.25 U	0.148 U	0.1480	0.213.0	5.0	0.173.0		0.161.0	
Butyl Methyl Ether	ug/m	ii Z		360		0.124 01	0.181/1	0.192.)	3.17 U	3.60	3.590	0.125 0	0.125 U	0.181)		Q.147 U		0.1361/	
rachioroethene	inc/m	ii vs. V	, 'L' &	160 VA	gán	0.233 UJ	0.339 Ui	7.451	5.97 U	6.8 U	6,76 U	0.2360	0.236 u	0.339 U	*	0.276 U	-	0.257 U	34.45
ucae	HE/m'	5209,/	New X	170000C	2.0	0.6171	0.9831	3.91./	3.32 U	3.8 U	3.76 U	1.43	1.51	2.12		1,46	+4	1.98	14.00
ns-1,2-Dichtoroethylene	pg/m²	NA N	88	MA	32±1	0.136 U)	Ø.198 UI	0.198 UI	3.49 U	40	3.95 U	0.1380	0.138 U	0.198 U	44	0,161.U	.758	0.15 U	31.65
ns-1,3-Dichleropropene	ur/m	HA	86 LA	NA .	- Line	0.156 U.I	4.5 (3)	4.5 UI	3.99 U	4.5 U	4.52 U	0.158 U	0.158 U	4.5 U	45	0.185 U	i ja ka	0.172 ().	X (60)
hioroethylene	we/m'	0.48 (C. 17.)	₩ 3V	# 10	1 35	0.185 U	0.269 UI	0.769 U)	4.729	5.4 U	5.35 U	0.1870	0.187 U	0,269 U		0.218 0		0.203 U	39.5
thlorofluoromethane	ue/m	NA .	解机	N/A	0.972	3.171	5.6 01	5.6 U3	6	19	7,6	1.18	1.26	5.60	1.17	1.27	1.1	1.3	1.17
yl acetate	ug/m	210	- 1 1866 4	7000	**	0.303 UJ	350/	3.5 VI	330	15U 26U	3,51 U 2,55 U	0.306 U 0.0889 U	0.306 U 0.0089 U	350 01280		0.358 U	***	0.335 U	100
nyi chiari de	we/m²	0,17 MA		7.7	0.972	0.0879 UJ 21.49	0.128 U i 30.452	0.128 U/ 396.762	2,25 U	26.2	7.9	23.701	21.308	32.866	1.475	0.104 U 25.36	1.301	0.0567 U 21.916	1.968
X's, Total	luc/m'		PARTIES AND	4	L	1 41.93	1 30,436	330,702		Augusta projeka je kritični projeka te na	L	A. Marries	A PARTY	2 ANDRE	A CAN W	£ 23.30	1.304	1 KAUTAD	L 1.700

Table 2-4. Faculty Housing Area Sampling Results Vigor Intrusion Investigation West Virginia State University, Institute, West Virginia

Part	T is	nees T	ACASEA.	IS-0564.	tale		0562	141		COLUMN	\$40.00 v			ED IAME				THE RESERVE	Spilate d'a		A STATE OF THE PARTY OF THE PAR				in a small little	100000000000000000000000000000000000000		COLOR SANDON MANAGEMENT AND ADMINISTRATION OF THE PARTY O	-	***************************************	
Color Colo			and the second	A STATE OF THE STA		416 0	1000000		07-011316			16 0	FR-1A6-012616		400	PR-IAG-06192015	1-1AS-012616				. , , , , , , , , , , , , , , , , , , ,	FR-1A4-061	ER-1403-01271605	19-0127165 I	AND PROPERTY OF THE PERSON NAMED IN	1779	Location>>				
The color of the		12.5 - 18.5 2/5/2016																1	0.0	0-0	o .	0.0	0.0	0-0		0.0	Sample Depth (leet)>>		Service Control		
Company Comp					17.147.157.55		.,,,,,,,,,	1717/1010		1	Wading		1,10,1010	1011013		W.W.W.	27400.000		9/23/1013	Treizoto.	***:	67,20743	1/10/10/10	UN SILIO		1/26/2016		Screening Levels (4			
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Table 2-4. Faculty Housing Area Sampling Results

Vapor intrusion investigation

West Vaginio State University, Institute, West Virginia

- a "Scienting levels are based an USEPA regional screening levels (RSLs, USEPA 2015b) for indoor ar for a residential exposure accounts.

 The RSLs are based on a 1E-06 (1 x 10 °) target carcinogenic risk for current exposure scenarios and a target non-cancer hozard question (PIQ) of time (1) (WVDEP 2001).

 b Soil gas screening levels are besid on USEPA (2015c) vapor infusion screening levels (VISLs) v1SLs are based on a viterousion factor of 0.03.
- a 1E-06 (1 x 10-0) target curcinogonic risk for residential exposure, a 1E-05 (1 x 10-5) target curcinogenic risk for commercial/industriel use, and a target non-centeer hazerd quetient (HQ) of one (1) (WDEP 2001).
- = = Not enalyzed & = The analyte was detected in the associated method and/or calibration blank
- J = The analyte was positively identified the associated numerical value is the approximate concentration of the analyte in the sample.
- N.3 = The analysis indicates the presence of an analyse that has been tentatively identified and the associated numerical value represents its approximate concentration.

 UJ = The analyse was below the reported sample quentitation limit. However, the reported value is approximate.

 U = The analyse was analyzed for, but was not detected above the reported sample quantitation limit.

pg/m² = Micrograms per Gubic Meter Bold indicates the analyte was detected

Shading indicates the result exceeded Residential Indoor Air RSL

a from the Conservation and American Africa Italicized results indicate concentration was detected above the Residential Sail Gas VIST

FOR SETTLEMENT PURPOSES ONLY INAOMISSIBLE UNDER FRE 408

DRAFT - FOR SETTLEMENT PURPOSES ONLY INADMISSABLE UNDER FRE 408

Soil Gas COPC Summary Campus Assessment

Campus Location					Faculty House	ing	E STATE OF THE STA	Fleming Hall	Quad	Dawnson Hall	JICS Hall		Student Union	A
Client Sample IC Dopti	Unite	VISL Residen tial Umit	VISL Commercial	FR-AA1-012616* 0-0	VP-1 8-10	VP-3: 8-10'	VP-4 8-10	VP-5 8-10*	VP-6 8-10'	8-10	VP-9 8-10°	VP-10 8-10	VP-11 8-10	VP-13 8-10°
Date Collected			Philip	1/26/2016	Britisher within the the in these	08/27/2016	Committee (Committee) (Committee) (Sept.	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/2016	08/27/20
Analyte		ALEACS:	/	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Recult
ICETONE APPRIAGON CONTRACT	µg/m³	1.00E+00,	4.50E+08	21 d	167	195	328	169	116	199	295	236	73.7	49.9
SENZENE A PARTERIAL N	µg/m³	12	620 うみ	0.601 J	19.4	54.7	78,4	733.7	24	30.3	57.5	55.3	18.8	13.1
CARBON DISULFIDE	hā/m,	2.40E+04、)	1.00E+05,~/\	0.107 UJ	3.96	140	110	30.3	118	384	602	318	112	85.9
HLOROBENZENE ** 19. 1944	µg/m³	170%	7300-	0.158 UJ	< 0.924	< 0.924	<0.924	<0.924	< 0.924	<0,924	<0.924	<0.824	<0.924	1.5
CHLOROMETHANE	µg/m³	3100	1.30E+04(°)	1,77 UJ	<0.413	1.03	<0.413	<0.413	<0.413	<0.413	<0.413	1,15	<0.413	<0.413
YCLOHEXANE	ug/m³	2.10E+05(~)	8.80E+05(/\	NS	<0.689	26.8	13.4	1.18	4.35	5.6	7.86	5.08	4.58	8.47
,3-DICHLOROBENZENE	µg/m³	NE	NE	0.207 UJ	<1.2	2.26	4.51	3.46	6.98	6.54	7.48	3.1	2.95	2.43
1-DICHLOROETHENE	µg/m³	7000	2.90E+04. 🕽	0.136 UJ	<0.793	0.959	<0.793	<0.793	< 0.793	<0.793	<0.793	<0.793	< 0.793	<0.793
RANS-1,2-DICHLOROETHENE	µg/m³	NE	NE	0.136 UJ	<0.793	3	1.9	< 0.793	<0.793	<0.793	<0.793	<0.793	<0.793	<0.793
THANOL	µg/m³	NE ,	NE	NS	549	435	547	489	1440	1330	697	359	451	257
THYLBENZENE SERVICE	µg/m³	37	1600 (20	0.149 UJ	<0.867	4.48	3.24	< 0.867	1.76	<0.867	1.1	<0.867	<0.867	1.17
-ETHYLTOLUENE	ug/m³	NE	NE	NS	<0.982	2.44	2.04	1.5	3 12	1.88	2.35	1,59	1.02	1.92
RICHLOROFLUOROMETHANE	µg/m³	NE	NE	1.17 J	1.34	1.56	1.53	2.58	1.96	1.86	2.18	22	27.6	2.16
NCHLORODIFLUOROMETHANE	µg/m³	3590 1	1.50E+04, 5	2.39 J	1.75	2.03	4.03	2.49	2.14	2.31	2.32	2.17	2.23	2.8
IEPTANE	µg/m³	NE	NE	NS	1.89	13.9	33.3	4.12	21.5	7.47	18.3	17.8	3.53	7.55
I-HEXANE	ug/m³	2,40E+0% 3	1.00E+05;-^\	NS	2.03	29.7	24.2	8.36	16,5	30.4	38.6	23.7	15.2	17.2
METHYLENE CHLORIDE	µg/m³	3400 G 10 L	6.80E+04, >	5.97 UJ	< 0.694	4.12	4.16	1.72	1.67	2.23	2.12	4.01	4.1	3
-BUTANONE (MEK)	ug/m³	1.70E+06	7.30E+05、~\	0.663 J	3.78	5.79	4.99	5.47	10.2	9.52	6.48	4.15	10.1	<3.69
(APHTHALENE Symathy	µg/m³	2.8	120 1	0.18 UJ	<3.3	12.6 /	20 /	B.09 V	10.2	10.9	15.2	10.6	<3.3	10.8
-PROPANOL (J-(P)-()	µg/m³	7000 (1)	2.90E+04 \	NS	<3.07	8,16	8.33	3.69	11.1	4.66	<3.07	<3.07	<3.07	<3.07
PROPENE (1) TOTA	µg/m³	1.00E+05 -A	4.40E+05.L)	NS	126	296	132	184	649	1210	1040	258	49.3	66.7
TYRENE	µg/m³	3.50E+04.	1.50E+05.1Å	0.146 UJ	< 0.851	1.67	2,29	<0.851	2.48	0.859	0.926	<0.861	<0.851	<0.85
ETRACHLOROETHENE	μg/m³	388-1-4()	5800	0.233 UJ	<1.36	1.49	1.52	<1.36	2.39	<1.36	1.82	<1.36	<1.36	<1.36
OLUENE TYPE PA	µg/m³	1.70E+05	7.30E+05A	0.617 J	2.32	48.5	53.7	4.87	50.6	9.52	21.3	18.1	11.4	13.4
2.4-TRIMETHYLBENZENE	µg/m³	240 /	1000 ((5)	0.169 UJ	<0.982	2.45	2.25	1.64	3.04	1.89	2.43	1.67	<0.982	1.95
3.5-TRIMETHYLBENZENE	ug/m³	NE	NE NE	NS	<0.982	<0.982	<0.982	<0.982	1.04	<0.982	<0.982	<0.982	<0.982	<0.982
2,4-TRIMETHYLPENTANE	na/w ₃	NE /	NE NE	NS	<0.934	9.68	8.65	<0.934	2.68	5.37	7.08	6.87	4.18	6.64
INYL CHLORIDE	µg/m³	5.6	930 (\^*)	0.0879 UJ	<0.511	11.8 /	6.27 🗸	<0.511	<0.511	<0.511	<0.511	<0.511	<0.511	0.917
18P-XYLENE	ha/w,	3508	1.50E+0A、 >	0.39 J	<1.73	15.3	10.2	2.05	5.4	2.05	3.35	2.18	<1.73	4.88
AND AND DESCRIPTION OF THE PROPERTY OF THE PRO		Communication of the Communica	A STATE OF THE PROPERTY OF THE	makan salah dan dikan dikan dikan salah dan salah dan dikan salah dan dikan di	negativism see this opinion in the land	Neivistissonssassasiyaitessässi	Security of the control of the security of the	entrasianimologia au japinė syllatiniaissiym	make a management of the contract of the contr	 Communication of the property of the communication of the c	Company of the contract of the	and the second second second second	and the second subsection of the second seco	2.54
D-XYLENE	ug/m³ Indicates	3506(makete included on DO	1.50E+04 S	0.149 UJ	<0.867	5.97	4.75	0.925	2.32	<0.867	1.22	<0.887	<0.867	in



EnviroProbe Project #15-0137-004

ug/m³ = micrograms per cubic meter
' Ambient air sample collected by DOW outside vacent faculty residence on 1/26/18

Attachment 2 Select Figures from CH2M Hill Reports





ED_001436_00000069-00141



Historical Topographic Map





TARGET QUAD

NAME: SAINT ALBANS

MAP YEAR: 1958

SERIES: 7.5

SCALE: 1:24000

SITE NAME: UCC Institute Fac.Eastern

Boundary Investigation

ADDRESS: HWY I-64 and State Route 25

Dunbar, WV 25064

LAT/LONG: 38.3795 / -81.7665

CLIENT: CH2M Hill, Inc.
CONTACT: Brett Fishwild
INQUIRY#: 4395961.1

RESEARCH DATE: 08/28/2015

October 1990

WWSU Property

Legend

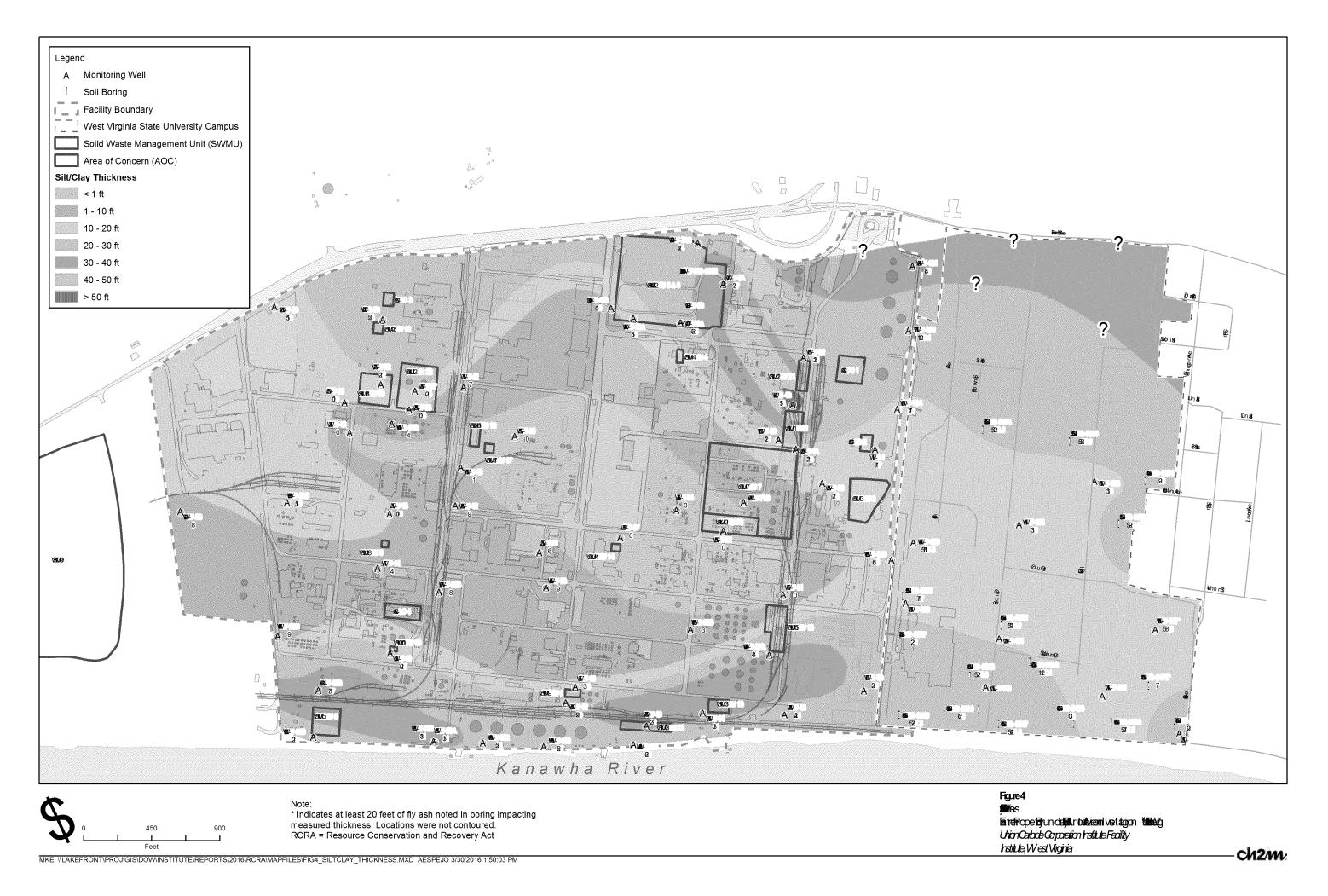
- Feature 1
- Go Mart Inc
- Institute
- Institute
- Mingdom Hall-Jehovah's Witness
- Lakin Field
- Shawnee Park
- Shawnee Regional Park
- WV State Police Academy
- WSU
- WSU
- West Virginia State University
- West Virginia State University

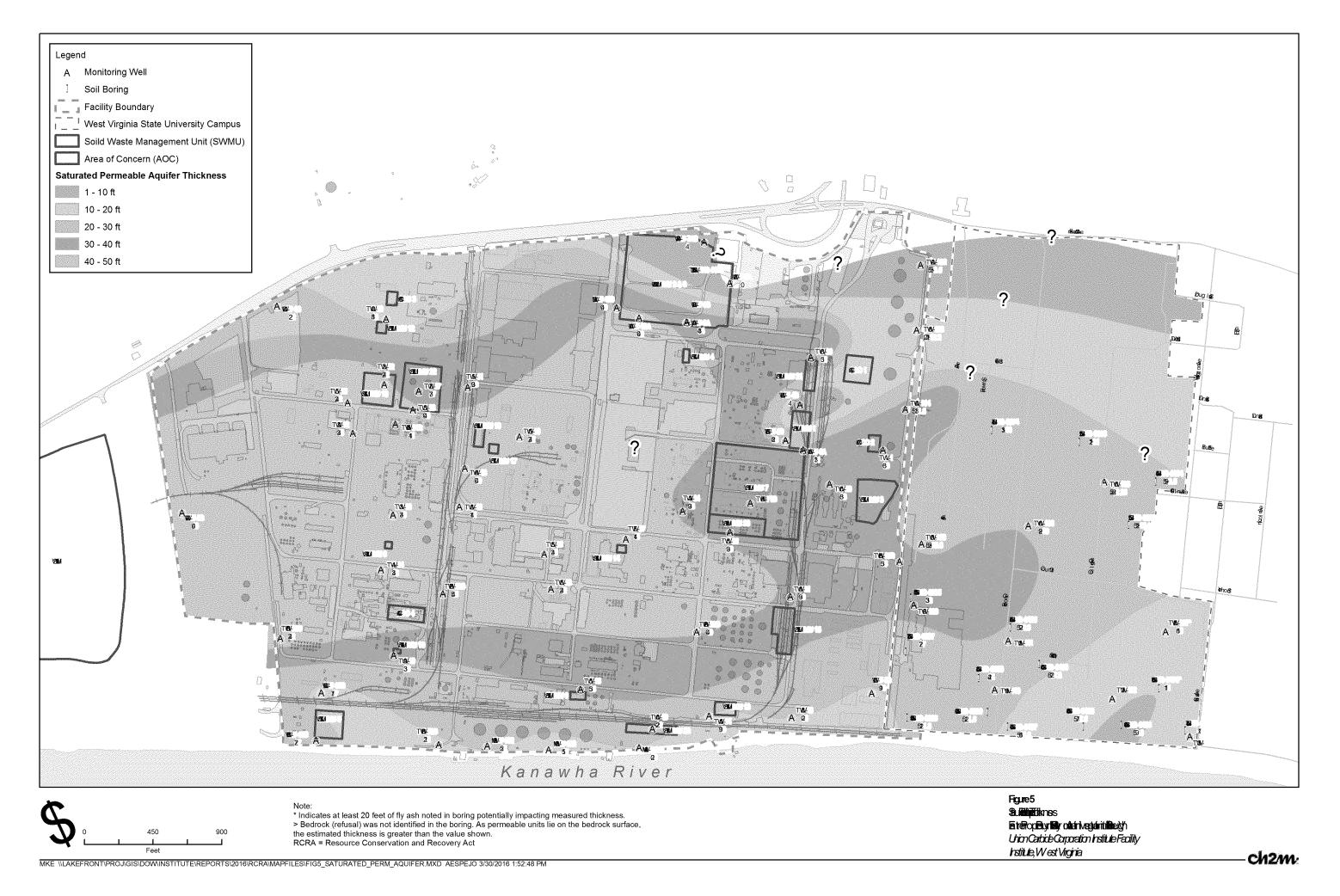
Google Earth

Image U.S. Geological Surv



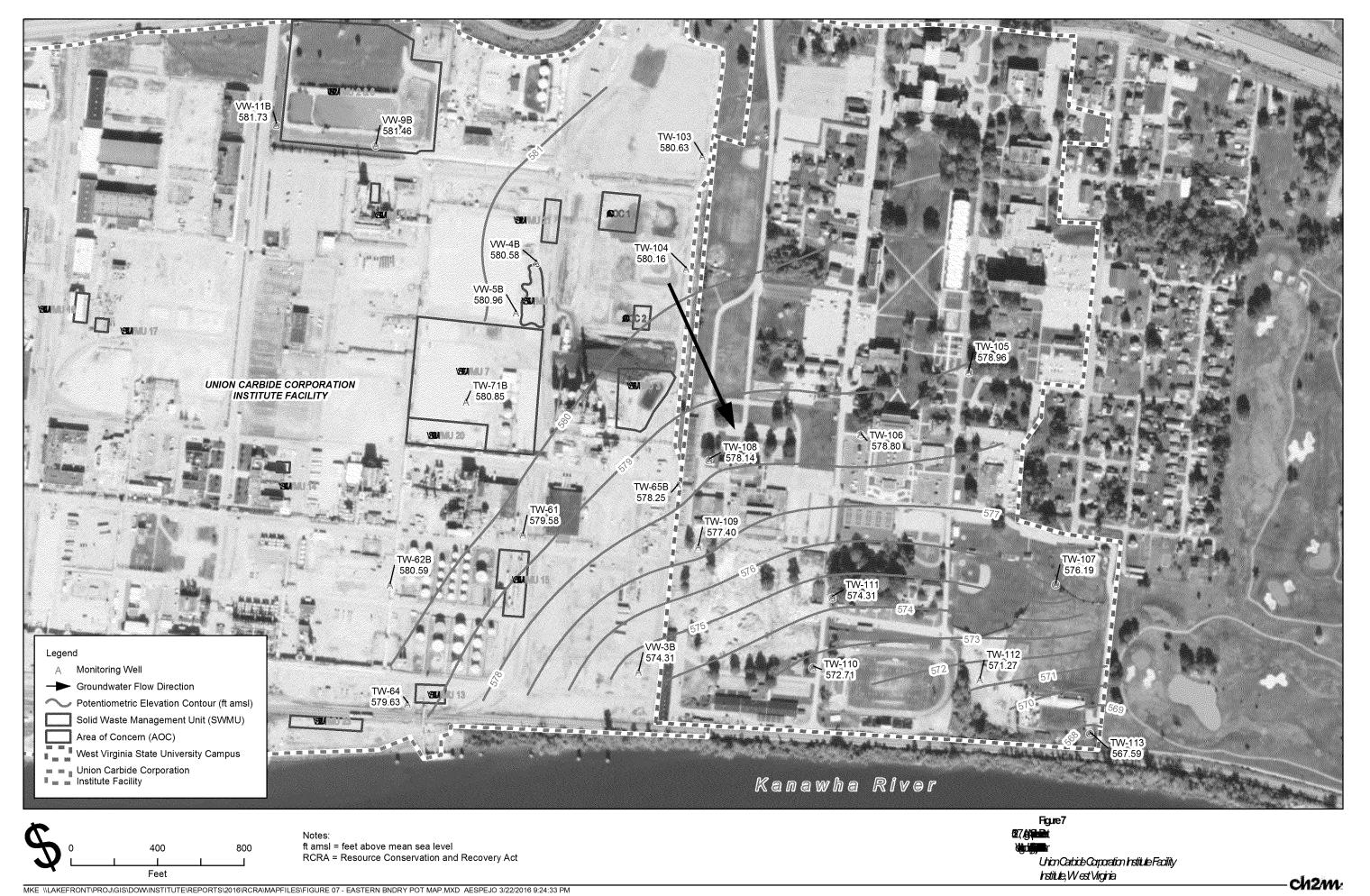
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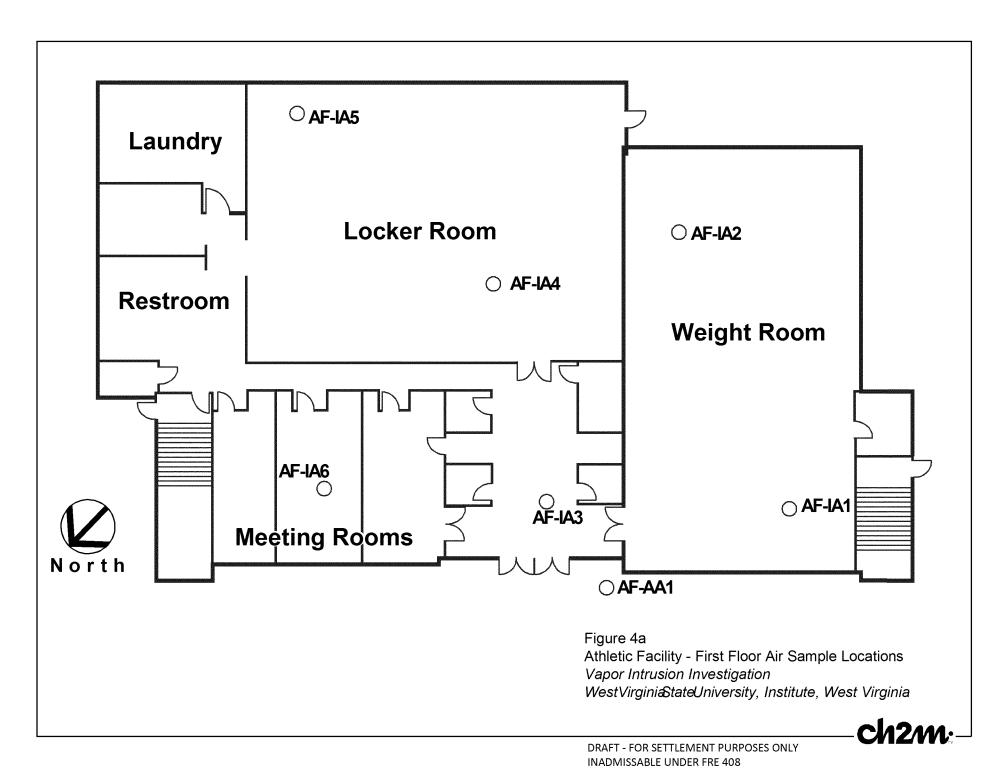
MKE \\LAKEFRONT\PROJ\GIS\DOWNINSTITUTE\REPORTS\2016\RCRA\MAPFILES\FIG6_HISTORICAL_SURFACE_WATER_DRAINAGE_FEATURES.MXD AESPEJO 4/6/2016 12:57:37 PM

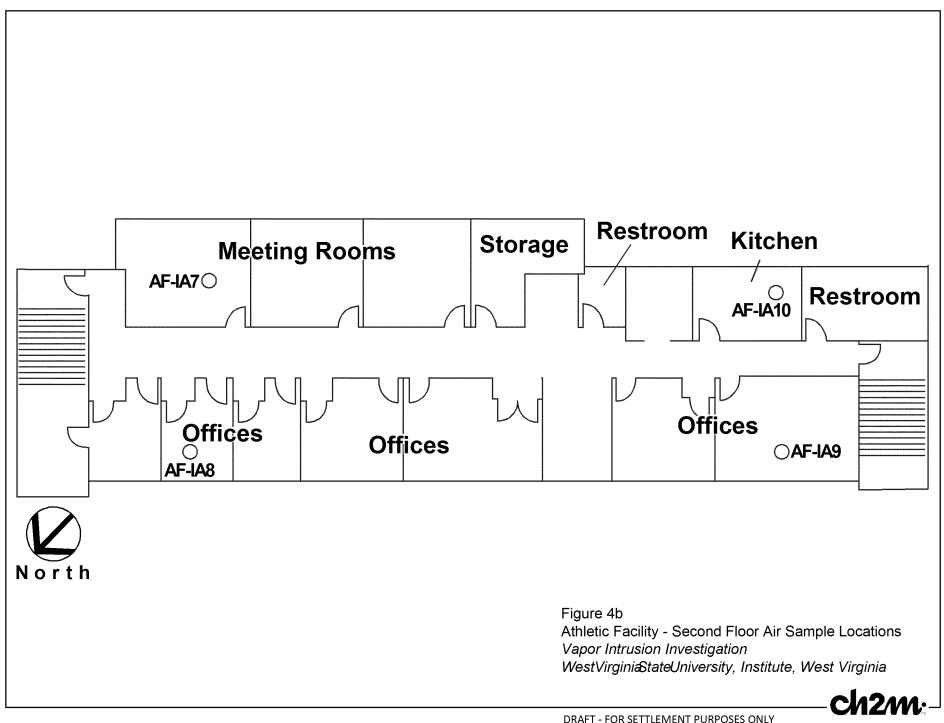


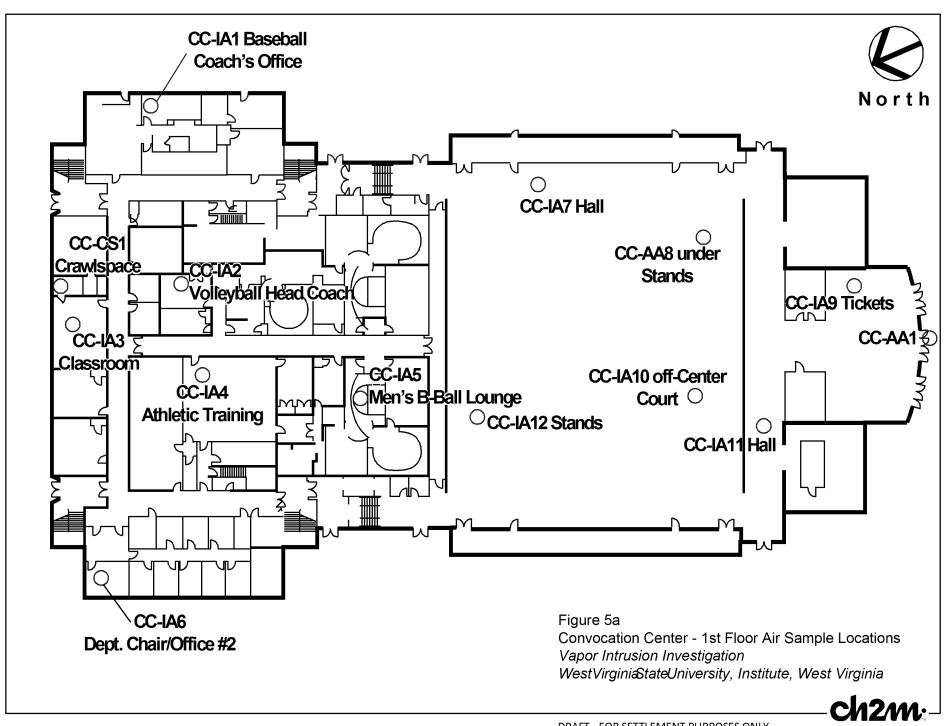


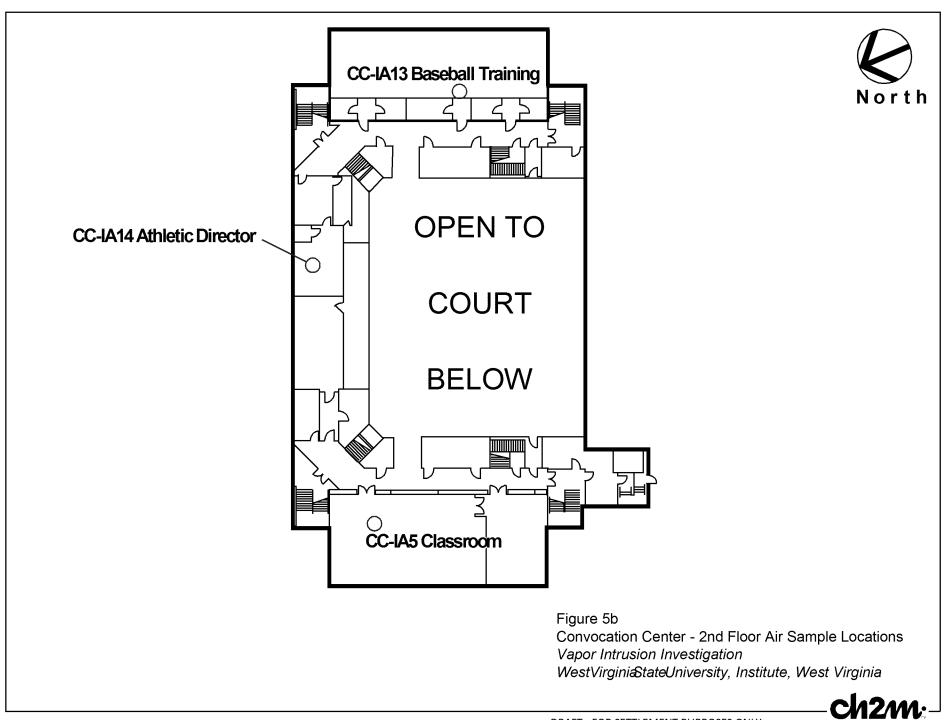












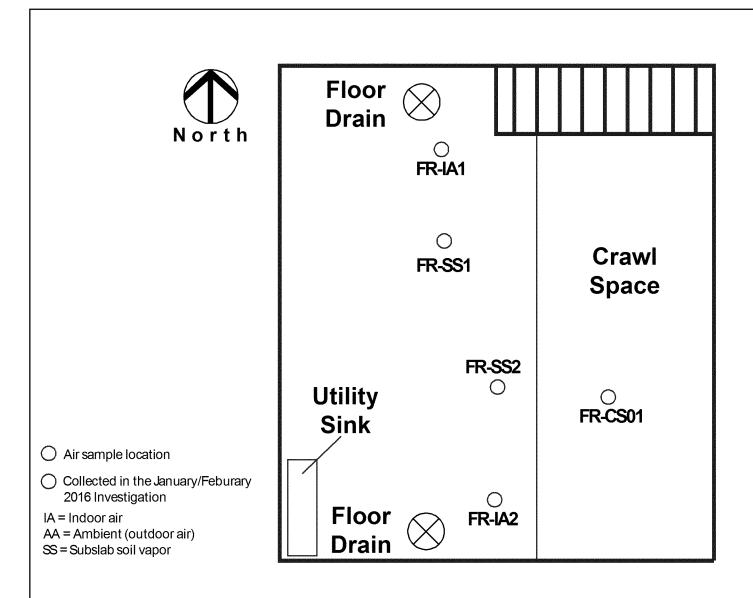
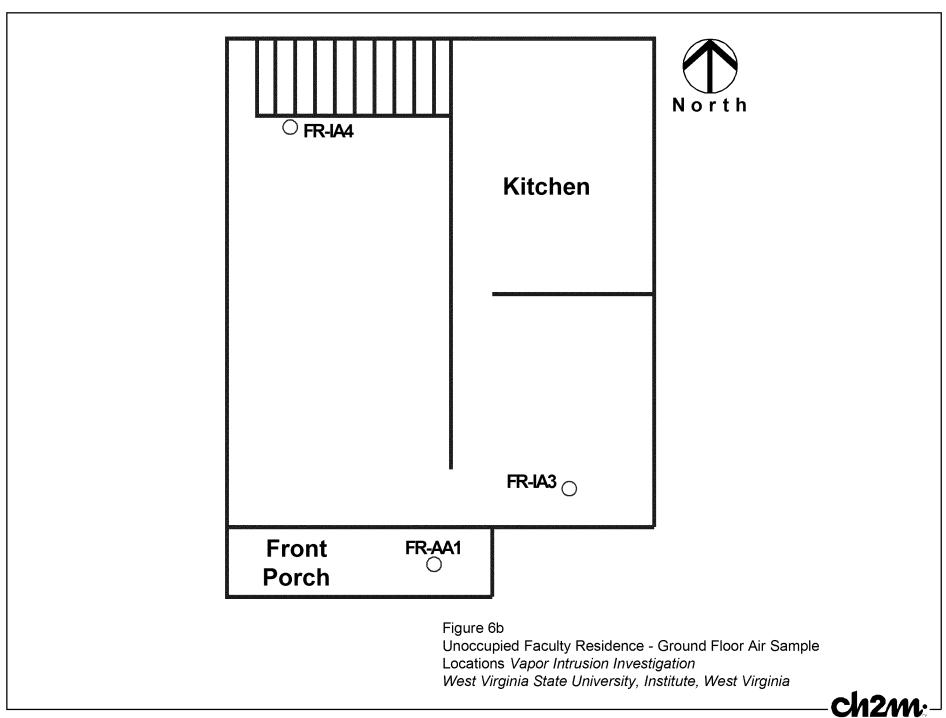


Figure 6a Unoccupied Faculty Residence - Basement Air Sample Locations Vapor Intrusion Investigation West Virginia State University, Institute, West Virginia

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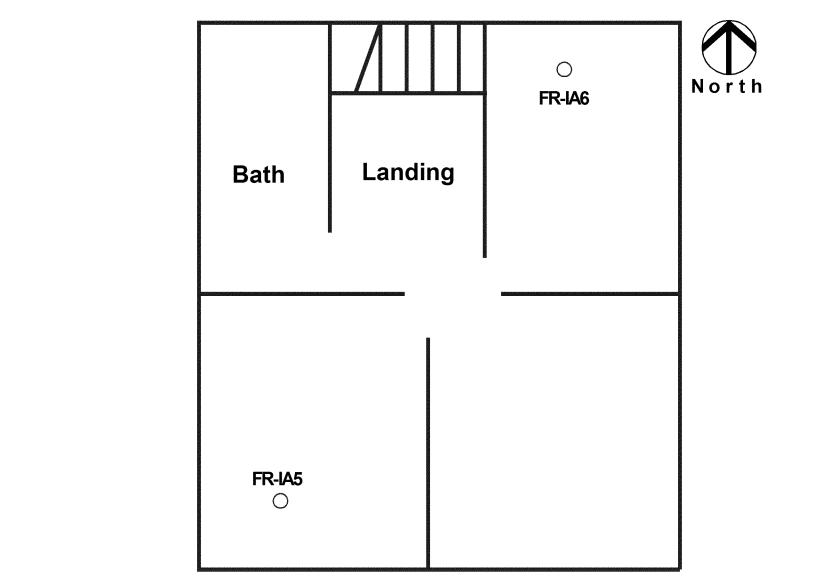


Figure 6c Unoccupied Faculty Residence - Second Floor Air Sample Locations Vapor Intrusion Investigation West Virginia State University, Institute, West Virginia

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